

# *The* **TOOL ENGINEER**

**AUGUST 1942**

**MACHINERY • PRODUCTION • TOOLS**



**HARDINGE  
HIGH SPEED  
SECOND OPERATION  
MACHINE**

Capacity  
1/16" to 1" with collets  
1" to 6" with step chucks  
1" to 5" with jaw chucks  
Spindle Speeds: 230 to 3900 R. P. M.

*Fast, accurate,  
dependable . . .*

Fast, accurate, dependable . . . these three words are always foremost when users state their experience with Hardinge Second Operation Machines.

*Performance has established leadership for HARDINGE™*

# **HARDINGE**

HARDINGE BROTHERS INC., ELMIRA, N.Y., U.S.A.

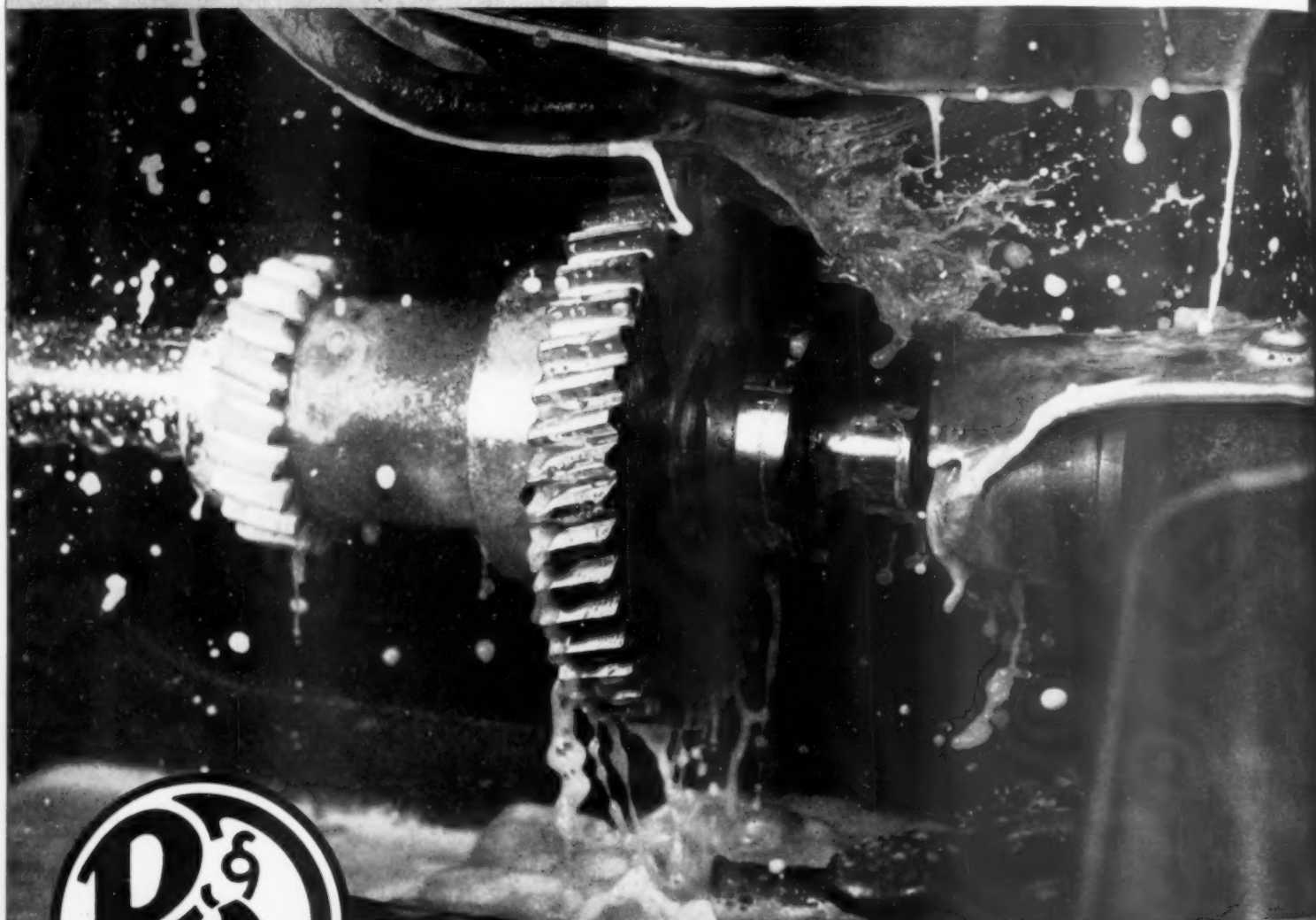
*Official Publication of the American Society of Tool Engineers*

# Today's streamlined gears must be GROUND

WHEN a gear can be comfortably overweighted, muscle-bound, loose-meshing . . . then it can get along with less accurate finishing than a gear grinder provides. *But the streamlined, fighting-trim, hard-working gears in today's aircraft superchargers, tank transmissions, and the like must be right.* Total load-per-gear-tooth is *greater*, so load distribution must be even, constant, accurate. That calls for gear grinding . . . there's no shortcut, no substitute.

Pictured below is Yankee quality at work — a gear being ground. It's a P&W gear grinder; we can't reveal where it's being used or where the gear will go . . . but we can admit that the tolerance is a scant  $\pm .0002''$ ! Hardening distortions are being removed . . . this gear will be *right* . . . only grinding will do it.

Gear grinders — typical precision machines — are one of hundreds of classes of Pratt & Whitney tools now at work all over the country building America's strength for Victory.



## PRATT & WHITNEY

Division Niles-Bement-Pond Company

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**STANDARD**  
*Dial Bore Gages*

"CONVOY  
YOUR PARTS  
THRU  
412  
PRODUCTION"

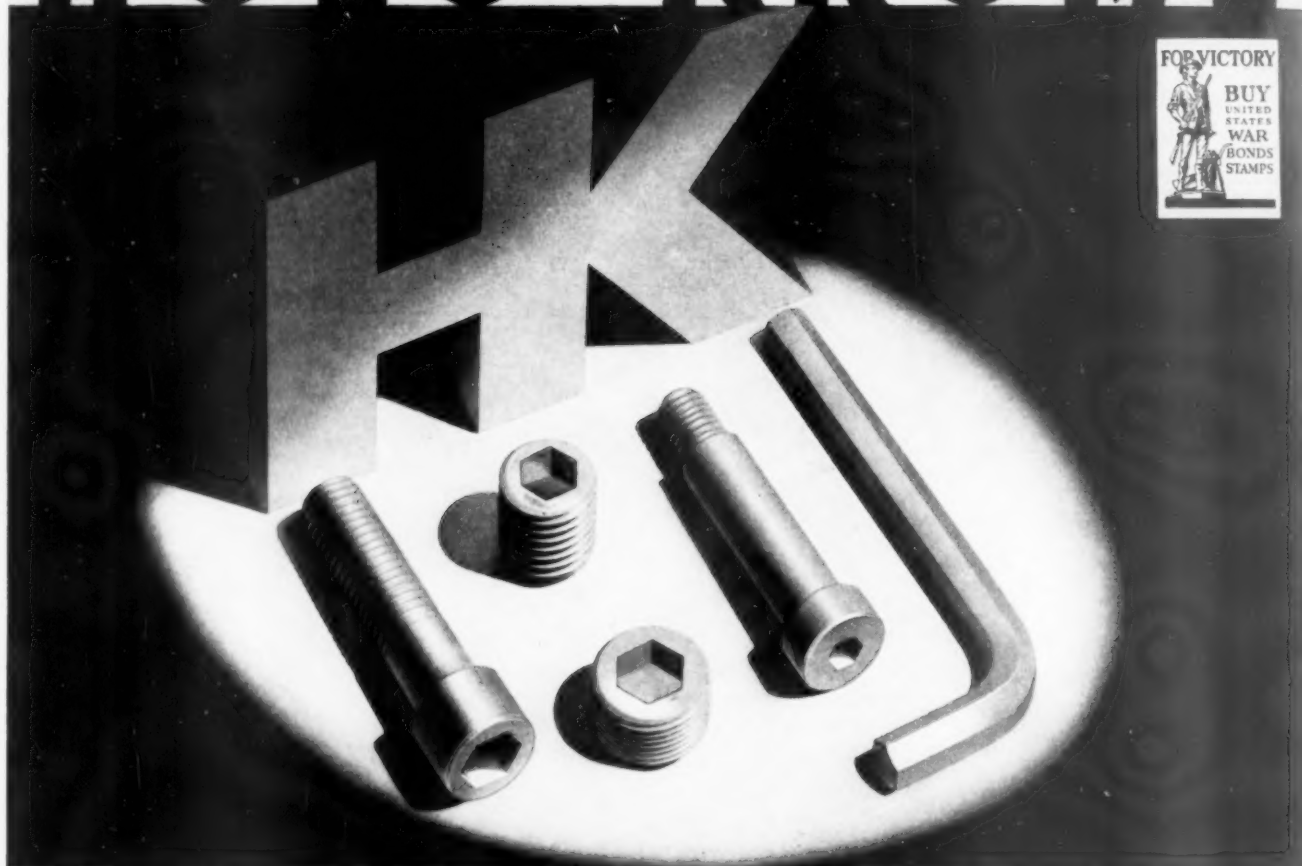
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*fibro forged*  
TRADE MARK

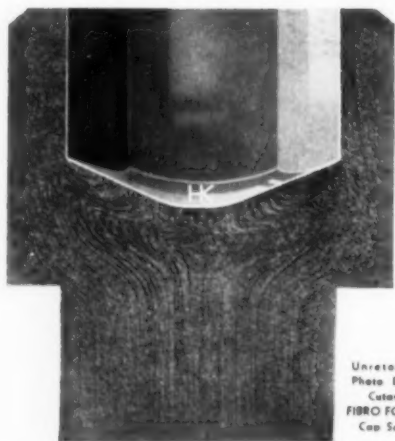
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**HOLO-KROME**



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# THE TOOL ENGINEER

Volume XI

AUGUST, 1942

Number 8

## Articles

Steel Substitutes: Tools, Jigs, Fixtures .....	65
Applied Tool Engineering .....	70
Tooling for Arc Welding .....	72
Small Shop Boom .....	78
An Ingenious Yankee .....	80
Broaching Gun and Rifle Barrels .....	81
Today's Need: Tool Engineering .....	87
Government Problems in Defense Inspection .....	89
Gaging: War Production Conference .....	95
Tap Design .....	99
Chrome Plating .....	105
Manufacturing Operations .....	112
The Battle of Production .....	113
Glimpses of Early Mechanics .....	121
Tool Conservation .....	131

## SMALL SHOP BOOM

To achieve total victory, America must produce. All pre-Pearl Harbor estimates of the nation's productive capacity have been outstripped and our industrial limit is yet unsighted. Why? The answer lies partly in the ingenuity, skill and dogged determination to finish the job possessed by Tool Engineers and mechanics. Exemplifying this are the mushrooming small tool and die shops born of a job to be done, a prayer and midnight oil. We believe the first behind the scenes view of this newly-born industrial stepchild is revealed on page 78 of this issue of The Tool Engineer Magazine.

## Editorial

Pay Dirt .....	63
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## Features

Tool Engineering Data Sheets .....	97
Washington Letter .....	114
Production Perspectives .....	123
Greenie—Cartoon Feature .....	123
New Equipment .....	132
Handy Andy .....	152
A.S.T.E. Doings .....	156
New Literature .....	160
The Crib .....	170
Passing Parade .....	176

## News

Washington Letter .....	114
Production Perspectives .....	123
Classified Advertising .....	186
ADVERTISERS' INDEX .....	188

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National Business Papers Assn.

Indexed Annually in  
the December Issue.

Published the first Thursday of each month, by The Bramson Publishing Company. Advertising, Editorial and General offices at 2842 West Grand Boulevard, Detroit, Michigan. Telephone MADison 4077. THE TOOL ENGINEER is the official publication of the American Society of Tool Engineers. Acceptance under the Act of June 5, 1934, at St. Joseph, Michigan, authorized December 18, 1940. Printed in the U. S. of A. Copyright 1942 by The Bramson Publishing Company.

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Center Scope is an optical locating tool of 45x magnification. It has a broad field and guide lines for centering. It can be used on any machine tool and provides an easy method to compensate for spindle or adaptor run-out.

## *Keeping Up-to-date Is Your Stock in Trade!*

*Getting out in front and staying there has always been a wise policy to follow. It's like money in the bank!*

*The progressive machine tool man employs the newest short cuts on the "last word" in equipment. He's the fellow who "gets the breaks" because his work is more accurate; his speed greater; his rejects, negligible.*

*Center Scope, the new "locating" tool, fits right into the scheme of things for men who follow this policy.*

*Center Scope will locate edges or layouts to the spindle axis, even "within a tenth." It is fast to use, and the operator can see that he is right.*

*With Center Scope — accuracy becomes a habit regardless of who uses it! It is not affected by wear, temperature or mechanical pressure.*

*Center Scope has many advantages of which price is vitally important. You can get your Variable Center Scope for only \$97.00, f.o.b. Los Angeles, California. The Edge Block is \$23.00 additional. Orders are filled promptly.*

*Call your Kearney & Trecker Dealer or write for Bulletin No. 201 B.*

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# EMERGENCIES

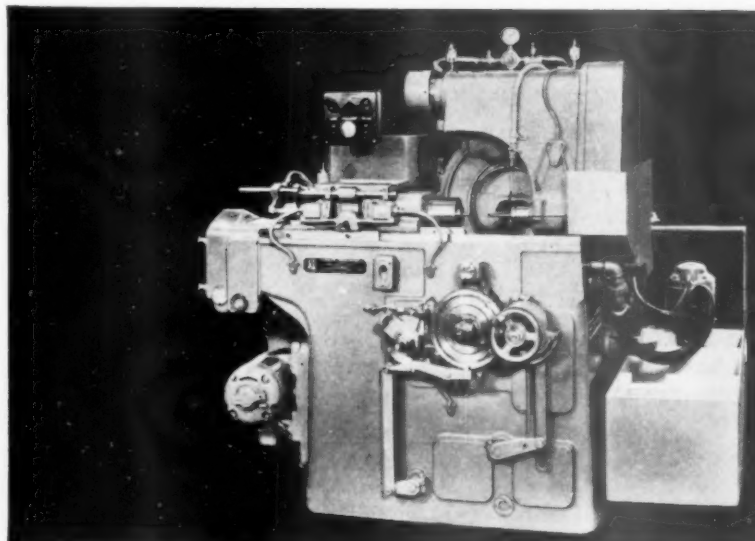


## "Rugged Individualists" 1840 Style

MODERN machine design and precision workmanship owe much to the "contractors" in the Vermont shops of a century ago. Not foremen, but independent operators of a business within a business, they hired their own hands and sold the "bits and pieces" made in their departments on a contract basis. Thus they had every incentive for the constant development of new ways to cut costs and improve their product. Conspicuous among the achievements of this system was the early interchangeable manufacture of muskets for the American and British armies and weapons for the western settlers. More than a century of such successive improvements has not only contributed to defense but enabled the growth of American industry as we know it today.

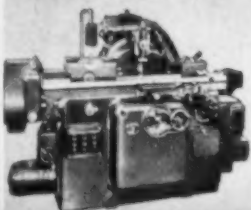
# JONES &

*Manufacturers of Ram & Saddle Type  
Universal Turret Lathes . . . Fay Auto-  
matic Lathes . . . Automatic Thread  
Grinding Machines . . . Comparators  
. . . Automatic Opening Threading  
Dies and Chasers*



Jones & Lamson Automatic Internal Thread Grinder,  
model TG-63 (6 x 3").

AUTOMATIC THREAD  
GRINDERS



OPTICAL  
COMPARATORS



RAM TYPE  
UNIVERSAL TURRET LATHE





# ARE NOTHING NEW TO JONES & LAMSON ENGINEERS

**T**O Jones & Lamson engineers, and to their direct predecessors in early Vermont machine tool shops, defense emergencies are nothing new. Working under the original contract system, they produced tools and arms to aid Britain in the Crimea, to help Texas win her independence, to equip the blue-clad armies of the United States in the almost forgotten war with Mexico and in the struggle to preserve the Union. Now, for the second time within the memory of living men, the full resources of Jones & Lamson Machine Company are working 24 hours a day, 7 days a week in defense of Democracy.

For more than a century such emergencies have been an old story to Jones & Lamson engineers and their predecessors. In every such crisis are the improvements, refinements and

developments originating here. To cite a single example, the modern technique of optical projection inspection and precision thread grinding for mass production is a Jones & Lamson development which had its roots in the last emergency and is now full grown to meet this one.

And the best feature of such developments is that they not only implement wartime production, but they enable industry to meet peacetime competition.

That is why it pays two ways to put production problems up to Jones & Lamson engineers. Both means write them today. Inquiries from large plants or small receive prompt and thorough study.

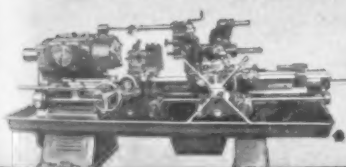
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SPRINGFIELD, VT., U. S. A.

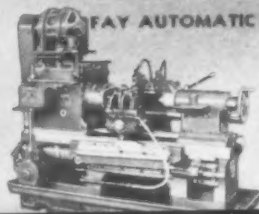


Jones & Lamson Automatic Thread Grinder, model  
TG-636 (6 x 36").

SADDLE TYPE  
UNIVERSAL TURRET LATHE



FAY AUTOMATIC LATHES



PROFIT PRODUCING  
MACHINE TOOLS



# HAYNES STELLITE ALLOY prolongs the life of hot-work dies . . .

*and in addition saves refitting time*

Haynes Stellite hard-facing alloy increases the life of hot-work dies because it resists abrasive wear at high temperatures. In addition, maintenance costs are greatly reduced—not only because dies have to be changed less frequently, but also because you can refit a hard-faced die in much less time than is required for refitting a plain steel die.

Shown at the right are 8 dies—used in the plant of a large motor manufacturer—which were hard-faced with Haynes Stellite No. 6 alloy. These hard-faced dies have outlasted steel dies from 3 to 6 times, and they are refitted in approximately half the time required for the ordinary dies.

## *Hard-Facing Is Used Profitably On Many Other Parts*

Haynes Stellite alloy is being used *profitably* on wearing parts in practically every industry. To decrease maintenance work . . . to reduce shutdown time . . . to maintain production . . . take full advantage of hard-facing. There is a Haynes Stellite rod for every type of application. For a descriptive price list of these materials, write or phone any district office.

### *Headquarters for Hard-Facing Materials*

**HAYNES STELLITE COMPANY**

Unit of Union Carbide and Carbon Corporation

New York, N. Y. ☐☐☐ Kokomo, Indiana

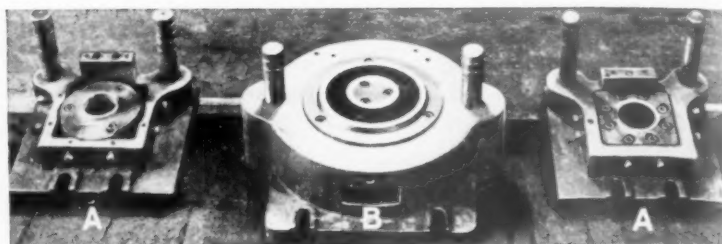
Chicago — Cleveland — Detroit — Houston

Los Angeles — San Francisco — Tulsa



Red-hard, wear-resisting alloy of cobalt, chromium, and tungsten.

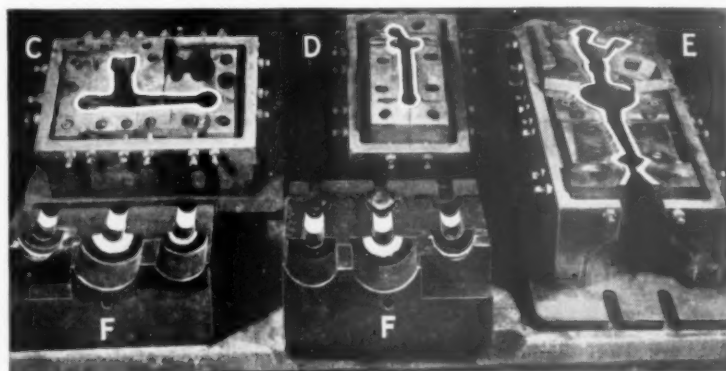
"Haynes Stellite" is a registered trade-mark of Haynes Stellite Company.



A—Hot-Trimming Die for Rear Axle Differential Gear  
B—Hot-Trimming and Piercing Die for Ring Gear

No. of Pieces Between Refittings	
Steel—4,000	Hard-Faced—20,000
Steel—2,500	Hard-Faced—15,000

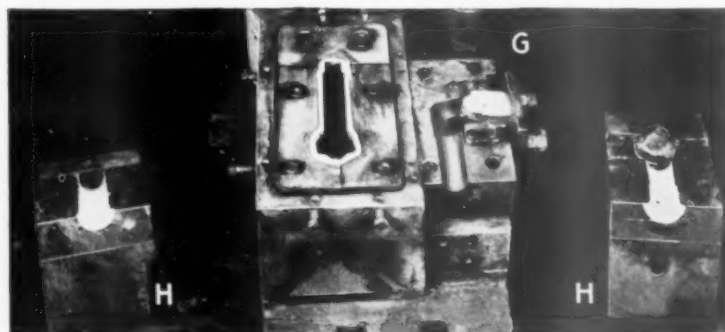
Hours Required to Refit Die	
Steel—16	Hard-Faced—6
Steel—20	Hard-Faced—12



C—Hot-Trimming Die for Wheel Support  
D—Hot-Trimming Die for Steering Crank  
E—Hot-Trimming Die for Front Wheel Support Arm  
F—Upsetting Die for Pinion Gear

No. of Pieces Between Refittings	
Steel—2,500	Hard-Faced—7,500
Steel—1,750	Hard-Faced—7,500
Steel—2,500	Hard-Faced—7,500
Steel—5,000	Hard-Faced—25,000

Hours Required to Refit Die	
Steel—16	Hard-Faced—8
Steel—16	Hard-Faced—8
Steel—40	Hard-Faced—20
Steel—120	Hard-Faced—70



G—Hot-Trimming Die for Steering Cross Shaft  
H—Upsetting Die for Pinion Gear

No. of Pieces Between Refittings	
Steel—3,500	Hard-Faced—15,000
Steel—5,000	Hard-Faced—25,000

Hours Required to Refit Die	
Steel—28	Hard-Faced—10
Steel—120	Hard-Faced—70

# WHAT'S THE ANSWER?

**CLOSER LIMITS!**

**MORE PRODUCTION!**

*What  
Machining  
Process?*

*Will It Require  
Skilled Operators?*

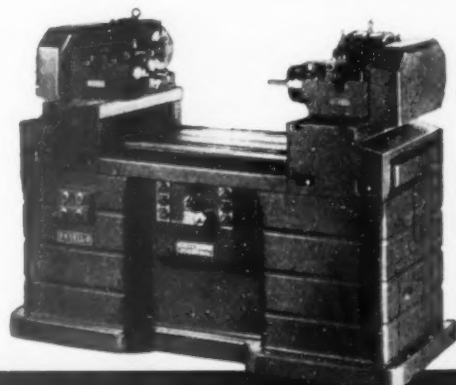
*What's the  
Best Machine?*

*Will It Be An  
Investment for Tomorrow?*

**T**HESE problems . . . more pressing now than ever before . . . find a specific answer wherever production of parts calls for boring, turning, facing, grooving with accuracy and speed. Ex-Cell-O Precision Boring Machines were designed and are made to do exactly this kind of work. With their sturdy, rigid construction, the flexibility in their application, their many automatic features, and simplicity in operation, they produce to "tenth" accuracy . . . and can "take it" round all the hours of the clock . . . today, when the greatest pressure that's possible is a national urgency . . . tomorrow, when post-war competition will make fast, accurate—and economical—production also a necessity.

**EX-CELL-O CORPORATION • DETROIT, MICH.**

There are nine standard styles of Ex-Cell-O Precision Machines that bore, turn, face, groove with accuracy and speed. They provide an extremely wide range for manufacturers facing production problems today . . . and tomorrow. Below is Ex-Cell-O Style 215-A—Senior Double End Precision Boring Machine.



**XLO**

EX-CELL-O means PRECISION

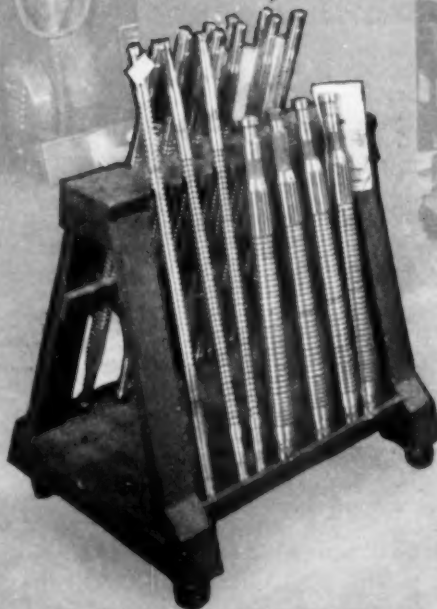
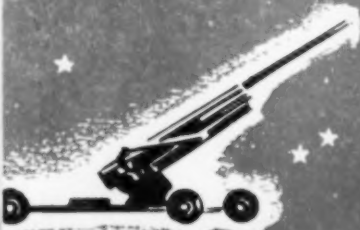
*Precision* THREAD GRINDING, BORING AND LAPPING MACHINES,  
TOOL GRINDERS, HYDRAULIC POWER UNITS, GRINDING SPINDLES,  
BROACHES, CUTTING TOOLS, DRILL JIG BUSHINGS, PARTS



# Detroit Broaches Are VITAL Tools in War Production

In the production of thousands of armament parts, no other metal cutting method can provide the same speed and accuracy secured by broaching. In some cases, broaches designed and manufactured by the Detroit Broach Company are performing cutting operations, now considered of vital importance, which could not be duplicated by any other method or combination of methods.

The possibilities and advantages of broaching, particularly in War Production, have by no means been exhausted. In your production, there undoubtedly are many operations on which broaching may be employed. A discussion of specific applications with a Detroit Broach engineer may provide you with a new view to increasing production . . . lowering operating costs . . . and contributing more to your part in the War Effort.



## TRIPLED CAPACITY ASSURES FASTER DELIVERY

Since the first of the year the capacity of the Detroit Broach Company has been tripled. The plant has been expanded . . . new machines have been installed and are now in operation twenty-four hours a day seven days a week. We can produce more broaches for you . . . NOW.



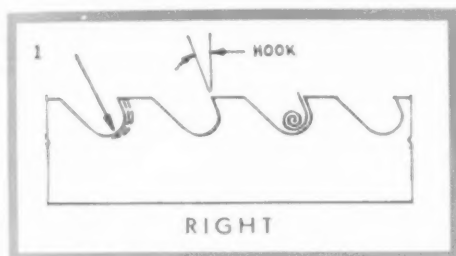
# Proper Care in Resharpening Will Prolong the Life of Your Broaches

The products of the Detroit Broach Company are designed and manufactured to give you maximum service on the jobs for which they are intended. The extra life which can be expected from them is entirely dependent on the care with which they are handled in your plant.

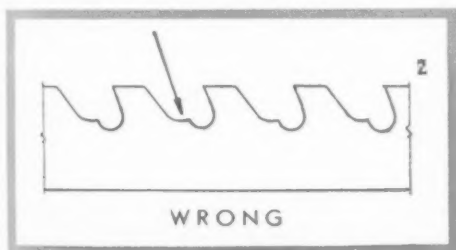
The resharpening of broaches is extremely important in prolonging the life of the tool, and to cover briefly the principal sharpening operations, we submit the following for your information:

## TOOTH FORMING

The form of the tooth is an all important factor in the proper working of the tool. For example it will be noticed in Sketch No. 1 that the proper method of resharpening is shown by dotted lines which indicate a succession of sharpenings. In each instance you will note that, as near as possible, the original form of the tooth is maintained.



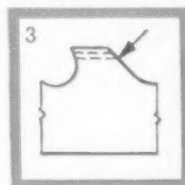
In Sketch No. 2 you will notice that, in resharpening, the operator has not blended the form. With this condition, in a great many instances the chip will stick and cause the tooth to load. If not cleaned out this may cause breakage at this point in the broach.



Also, the proper hook angle should be maintained as different materials require different hook angles. This information should be available on the tool drawing.

On surface broaches, where the broach

has means of adjustment by the use of shims, wedges, etc., the sharpening can be accomplished by backing-off the top of the teeth as shown in Sketch No. 3. Because this method reduces the depth of the tooth form—or the chip space—it is occasionally necessary to supplement the form sharpening, as previously described and illustrated in Sketch No. 1, after the tooth form has been altered by repeated backing-off. This combined sharpening process will increase the life of the broach tremendously.



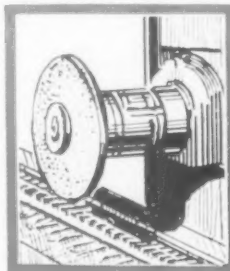
## TOOTH FINISHING

Another important factor is the finish obtained on the face of the cutting tooth. When the face is rough, it is only natural that the cutting edge itself will be rough. If looked at through a magnifying glass this rough cutting edge looks much like the teeth of a saw. This, of course, means that in actual operation these teeth will break down much faster than if the face of the tooth were perfectly smooth, thus making the cutting edge equally smooth.

## THE WHEEL TO BE USED

In sharpening broaches it is well to use a soft wheel which will give a much smoother face.

This is something that cannot be definitely set as the type of the machine will govern somewhat the size of the wheel, and also the grain.

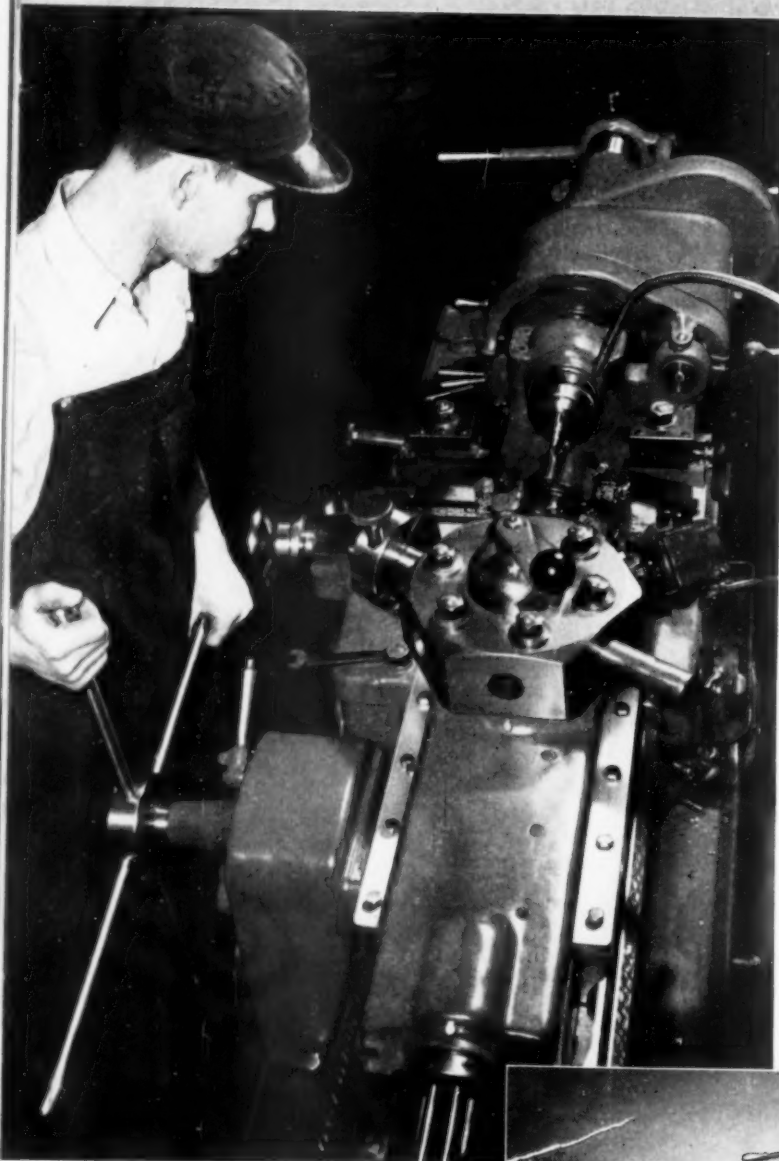


Copies of this page, printed on heavy paper, and suitable for hanging in the shop are available without obligation upon request.

**DETROIT BROACH COMPANY**  
20201 SHERWOOD AVENUE • DETROIT, MICHIGAN



# Production Plus Precision



Modern in design, built with extreme precision, South Bend Turret Lathes are fast—accurate—versatile. They have the speed, power and rigidity for efficient quantity production of duplicate parts without sacrificing the precision accuracy or high quality finish usually considered possible only on small lots.

Features responsible for the outstanding performance of this new turret lathe include exceptionally rigid turret and carriage construction, a quick change gear box providing a wide range of power feeds for the universal carriage and the turret, complete thread cutting range through leadscrew and half-nut, and a wide range of spindle speeds.

## SPECIFICATIONS

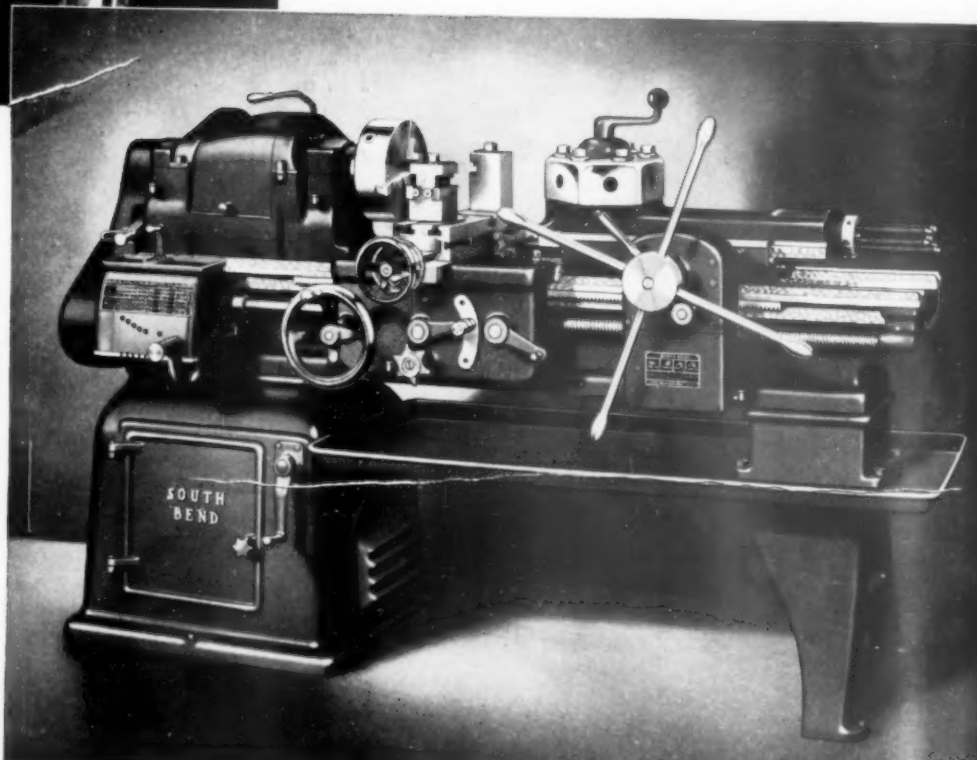
### No. 2-H South Bend Turret Lathe

Hole through spindle . . . . .	1 3/8"
Maximum collet capacity, round . . . . .	1"
Swing over bed and saddle wings . . . . .	16 1/4"
Spindle speeds, twelve . . . . .	16 to 880 R.P.M.
Effective feed of turret slide . . . . .	6 1/8"
Distance between spindle nose and turret . . . . .	30 1/2"



### Navy "E" for Excellence

Awarded to the South Bend Lathe Works for outstanding performance in the production of ordnance material for the United States Navy.



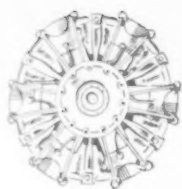
# SOUTH BEND LATHE WORKS

Dept. 925, South Bend, Ind., U. S. A.

Lathe Builders For 35 Years







# WANTED



## 50 PRODUCTION EXECUTIVES

**Must be top-flight men of proven ability, capable of directing the many divisional operations of one of the world's largest aircraft-engine plants.**

The Dodge Chicago Plant, division of Chrysler Corporation, now being built in the Chicago area, wishes to have associated with it a large group of men who have demonstrated their specialized talent, executive ability and high character.

The contract held by Chrysler Corporation for the production of aircraft engines is an outstanding commitment in the war program. It requires doing another high-precision job on a mass-production basis.

This gigantic plant will be one of the world's largest under one roof. Machine tools, equipment and facilities will be the finest and most modern. The personnel must measure up to the same high level of individual efficiency.

This war project demands executive supervision of men, materials and machinery on a scale heretofore unknown in industry. The Dodge Chicago Plant, division of Chrysler Corporation, is determined, therefore, to select as executives men who can guarantee the performance required by patriotic necessity and exacting manufacturing standards.

The Production Executives chosen for this painstaking task must be experts, backed by years of proven skill—both technical and managerial. Thousands of able Americans will work under their direction in round-the-clock shifts. Thousands of precision instruments and production tools will be the responsibility of these top men. That is why they all must be exceptionally good!

### EXECUTIVES WANTED FOR THE FOLLOWING DIVISIONS—

ALUMINUM FOUNDRY  
MAGNESIUM FOUNDRY  
FORGE  
HEAT TREATING & PLATING

MACHINE SHOP:  
Crankcase • Crankshaft  
Connecting Rod & Piston  
Cylinder Head & Barrel Assembly  
Gear Cutting • Precision Parts

ASSEMBLY & RE-ASSEMBLY  
INSPECTION  
WORKS ENGINEERING  
MASTER MECHANICS

**NOTE:** *Here is an unusual opportunity for men who are eager to become affiliated with a large organization engaged in the production of vital war materials. Give age, qualifications and salary expected. Proof of citizenship required. All correspondence will be kept confidential. Appointments will be made for personal interviews at your convenience. Address your application to Box 738, care of this paper.*

**DODGE CHICAGO PLANT**  
*Division of* **CHRYSLER CORPORATION**

**ARMY**

**NAVY**

**VAN NORMAN WINS**

**ARMY and NAVY STAR**





**IN ACKNOWLEDGING THE AWARD TO HIS COMPANY  
OF THE ARMY AND NAVY STAR, VAN NORMAN PRESIDENT  
JAMES Y. SCOTT SAID IN PART:**

"... this flag is more than just a flag. It symbolizes the tie that today exists between the fighting men of our Army and Navy and the fighting men and women of our labor battalion. It is a symbol of a new, greater spirit... of unity, of devotion, of loyalty and determination in the cause of victory which we must and shall have, and a unity of thought between all sections of our people in serving their country."

This burgee was recently raised over the Van Norman plant in recognition of the company's record in producing milling machines and oscillating radius grinders for war-production plants, and automotive service machines for the armed forces.

To the last man and woman now wearing the Star button, Van Norman regards this insignia as a challenge for the future... to top the highest former levels of production. And this challenge will be met... for Van Norman will keep on earning the Army and Navy Star every hour of every day, until Victory is final and complete.

**VAN NORMAN MACHINE TOOL CO., SPRINGFIELD, MASS.**





# LIPE

## PRODUCTION TEAMS

... Our Answer to the Axis  
Combat Teams!

• Mechanical Blitzkrieg introduced the combat team, the balanced combination of bomber and tank, of infantry and armored car. And now on the industrial front it's the Lipe Production Team, the balanced combination of fully automatic and manual carbo-lathes. Lathes that fit high-speed carbide-tool cutting into a completely rounded procedure . . . obtaining maximum output with the right machines for the job, and with minimum investment and labor cost. Write for details.

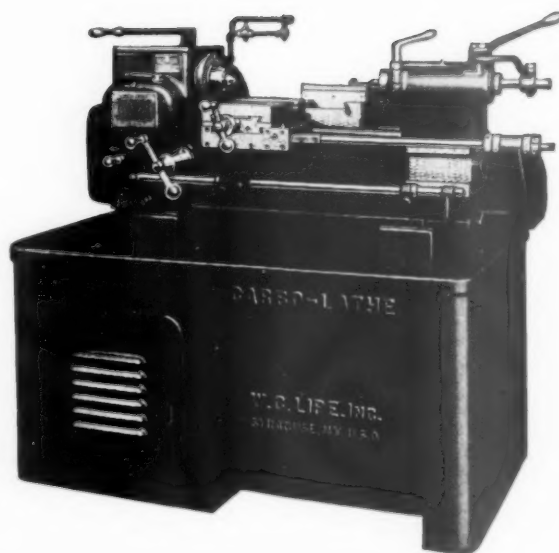


### The LIPE Carbo-Matic Lathe 100% HYDRAULIC CONTROL

Entirely automatic, requiring minimum skill on the part of the operator, this lathe is so powerful and so rigid that it takes deeper cuts through the toughest alloys with amazing speed and precision. It's the anchor machine in any production program, a lathe that turns to four decimal accuracy . . . with no out of round . . . no out of true . . . and worth while reduction in tool wear and breakage. Hydraulic control governs holding equipment, longitudinal and cross feeds and tailstock quill.

### The LIPE Carbo-Lathe MECHANICAL CONTROL

Semi-Automatic. Provides the high spindle speeds for efficient, low-cost turning of die castings, plastics and other fast-cutting materials . . . plus the rigidity and smoothness of power and feed to "hog off" tough alloy steels to rough-grinding tolerances. A lathe with a new, non-distortion, trussed-box base to assure economy of tool wear, tool breakage and part spoilage.



MORE THAN A HALF CENTURY OF PRODUCTION MACHINE AND MACHINE-TOOL MANUFACTURE



# LIPE-ROLLWAY CORPORATION

*Syracuse, N.Y.*

# **“LOGAN”**

## **AIR EQUIPMENT**



## **AS APPLIED TO LIPE CARBO-LATHE**

- 1** “LOGAN” Model “R” Air Cylinder
- 2** “LOGAN” Reducing Valve and Air Filter Unit
- 3** “LOGAN” Model “p” Air Control Valve
- 4** “LOGAN” Parallel Grip Collet Chuck

This Lipe Carbo-Lathe is tooled for turning armor piercing projectiles. The headstock is equipped with a “LOGAN” Model “R” Rotating Type Air Cylinder for the operation of a “LOGAN” Compensating Type, Parallel Grip Collet Chuck. This Cylinder is operated by a “LOGAN” Model “p” Poppet Type Hand Control Valve. In addition, this Carbo-Lathe is equipped with a “LOGAN” Reducing Valve, Automatic Lubricator and Air Filter Unit. “LOGAN” Sales Representatives and “LOGAN” Engineers will be glad to make recommendations on your production problems.

★ **LOGANSPOUT MACHINE, INCORPORATED** ★

902 PAYSON ROAD

LOGANSPOUT, INDIANA

Manufacturers of Air and Hydraulic Devices, Chucks, Cylinders, Valves, Presses and Accessories



# T-04

## TUNGSTEN-TITANIUM CARBIDE

**THE NEAREST APPROACH IN TOUGHNESS AND STRENGTH  
TO HIGH SPEED STEEL YET DEVELOPED IN A CARBIDE**

**EASY TO GRIND**—Firthite T-04 will take a keen, smooth edge and can be ground to steep rakes and clearances with deep chip-curling grooves.

**UNIQUE**—Firthite "GRADE T-04" Tungsten-Titanium Carbide is a Firth-Sterling development—the result of years of research. It sets new performance standards. T-04 is especially recommended for heavy duty, interrupted cuts, coarse feeds, etc.

**UNIVERSAL IN APPLICATION**—Firthite T-04 is the closest known approach to a **universal grade** of carbide. It approximates high-speed steel in **toughness** and **strength**. Production records show that T-04 gives uniformly fine performance in such varied applications as cutting armor plate, roughing softer steels, machining both cast iron and chilled cast iron—also other metals.

**WHATEVER** you are machining, use FIRTHITE. It's aces! Besides T-04, other grades of Firthite Tungsten-Titanium Carbide are available and will likewise **SAVE YOU MONEY**. They cover the entire field of Steel Cutting with maximum efficiency. **GRADE TA** is for general use on certain steels.

**WILL STAND ABUSE**—Firthite T-04 is tough, strong, wear-resistant. It withstands abuse from intermittent cuts, old machines, excessive overhang, inexperienced operators, etc.

**GOOD FOR INEXPERIENCED TRAINEES**—Because Firthite T-04 does not require extra care in operation, it is the logical choice for training new operators in the use of sintered carbides. It is also ideal for any new application.

**CONTAINS TITANIUM**—The **Titanium** ingredient in T-04's composition plays a triple role: (1) converts an otherwise ordinary tungsten-carbide grade into a star performer in cutting steel; (2) lowers the price to you; (3) precludes any possible shortage, since **Titanium** is the ninth most plentiful mineral and the domestic supply is more than ample for ALL requirements.

**GRADE T-16** is for light, rapid finishing of harder steels.

**REMEMBER**—a pound of Tungsten used in FIRTHITE does many, many times the work of a pound of Tungsten used in high-speed steel.

TOOL STEELS AND  
CARBIDES FOR COMPLETE  
SHOP TOOLING

***Firth-Sterling***  
**STEEL COMPANY**

OFFICES: McKEESPORT, PA. NEW YORK HARTFORD LOS ANGELES CLEVELAND CHICAGO PHILADELPHIA DAYTON DETROIT

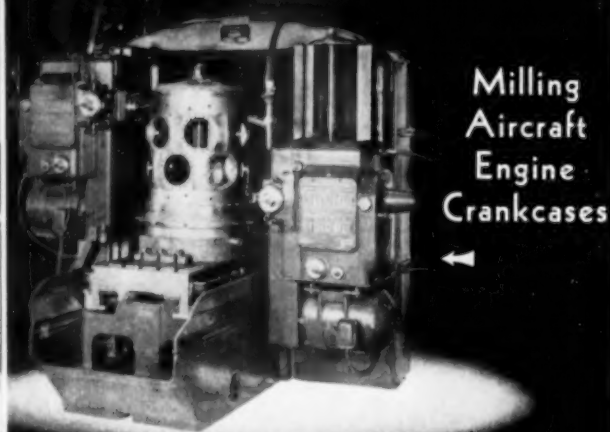


# YOUR BEST BET

## *FOR*



# SUNDSTRAND Machine Tools *for Urgent War Work!*



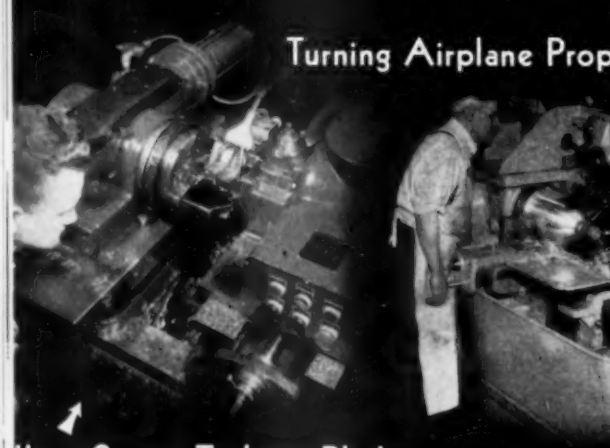
Milling  
Aircraft  
Engine  
Crankcases



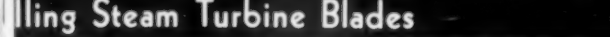
Milling  
Airplane Engine  
Master Rods



Turning  
Airplane Pistons



Turning Airplane Propeller Domes



Milling Steam Turbine Blades

Sundstrand Automatic Lathes and Rigidmills are doing urgent work for all the armed forces, and for many critical sources of supply. For the *Air Arm*; they machine engine parts in enormous quantities, engine accessories, blades and other propeller parts, landing gear components, instrument parts and armament. For the *Land Forces*; parts for motors, transmissions, and other units that go into tanks, trucks, tractors, and transport vehicles. For the *Navy*; a variety of work-pieces ranging from steam turbine blades to parts for mosquito boat engines, submarine diesels, and torpedoes. For the *Fire Power* of all branches, they are used widely in the mass production of rifles, pistols, revolvers, light and heavy machine guns, rapid fire cannon; also shot and shell, bombs and other ammunition.

On additional war work, Sundstrand Engineered Production Service develops most effective applications of Sundstrand standard equipment — meets a host of unusual requirements by creating semi-standard machines that give remarkably satisfactory results in speed, production, adaptability and economy — have designed wholly special machines when necessary. This cooperative service saves time for hard-pressed executives and engineers, quickly gives them reliable proposals on production milling, turning and related operations. It is available, without obligation, to all manufacturers in accordance with official urgency ratings. Sending complete accurate data, correct drawings, and all necessary additional information with each specific inquiry will save time all around and help our common cause . . . — Victory.

**Get These Bulletins** — Additional information about uses of Sundstrand Machine Tools on war work is contained in two timely publications. One illustrates machining of airplane engine and propeller parts. The other shows shell-turning, complete with diagrams and data. Write for both. Just ask for Bulletins 803.

## Airplane Engines . . .

Crankcases, Pistons, Master Rod, Articulated Rods, Magneto part, Piston Rings, Cylinder Sleeve, Super-charger parts.

## Airplane Propellers . . .

Blades, Barrels, Domes, Dome Retaining Nuts, Hub Spiders, Con.

## Steam Turbines . . .

Various milling operations on turbine blades of many types.

## Projectiles . . .

Turning operations on shell and shot, ranging from 20 m.m. to 161 m.m. Parts for torpedoes and bombs.

## Tanks . . .

A large variety of parts for engines and transmissions.

## Small Arms . . .

Milling and turning operations on rifles, pistols, and machine gun of all sizes and types.



# SUNDSTRAND MACHINE TOOL CO.

2532 ELEVENTH STREET, ROCKFORD, ILLINOIS, U. S. A.



## ***TWO*** TOOL STEELS CAN CUT AS CHEAPLY AS ONE

**W**HAT'S more important, two tool steels can cut twice as fast as one, and speed is the prime urgency in war production.

But there are ways of increasing production beside installing more modern types of machine tools. A better tool steel, or one better suited to an individual job, can materially speed up the work your existing equipment is capable of doing.

Take the case of a big Detroit plant, using DBL High Speed Tool

Bits instead of a high-tungsten variety, machining castings of X-1340 steel with a surface hardness of 33 Rockwell C, and a subsurface hardness of 26-28C. The DBL Tool Bits showed 30% increase in work done between grinds, running at 166 RPM against a previous speed of 100 RPM.

Our Service Staff is ready to help you team up tool steels with your production jobs, for more work done per machine. They'll show

you the best *alternate* steels, too, as a precaution in keeping the lines moving.

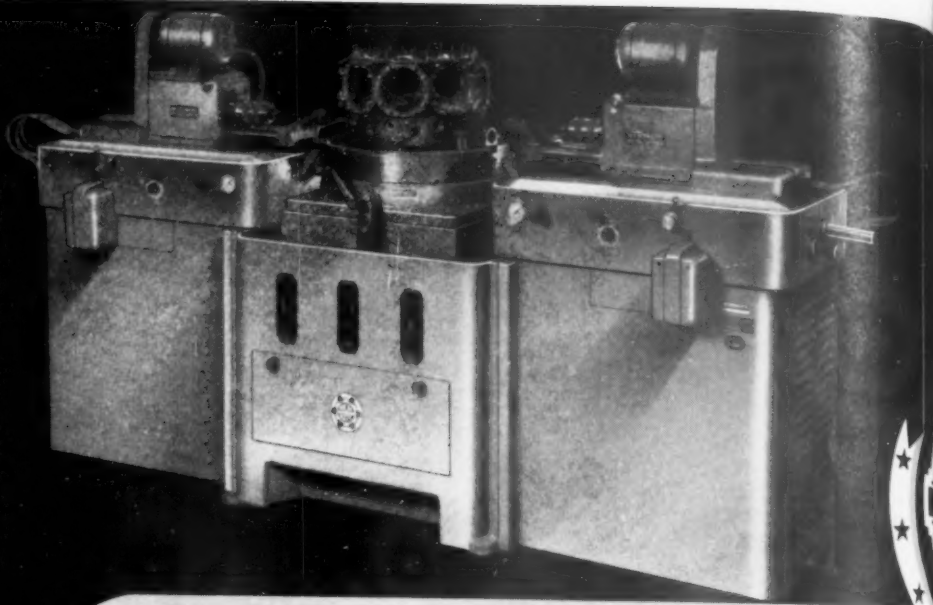


***Allegheny Ludlum***  
**STEEL CORPORATION**  
GENERAL OFFICES: PITTSBURGH, PENNSYLVANIA



Honing valve guides after assembly in crankcase (Radial Aircraft Engine) on Double End Hydrohoner with Micr-O-Size control—production 3 to 6 complete assemblies per hour—removes average of .0005" to .001" stock per bore—generates uniform size within .0003" to .0005", accuracy within .0001" to .0003" and surface finish within 3 to 5 micro-inches, r.m.s.

**AIRCRAFT...—**



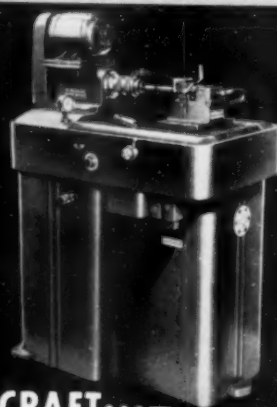
**AIRCRAFT...—**

Feathering Oil Pump Gear Teeth (Aircraft Engine) external honing.



**AIRCRAFT...—**

Honing Piston Pin Bores (Aircraft Engine).



**AIRCRAFT...—**

Honing Valve Guides (Aircraft Engine) before assembly.



**HYDRAULICS...—**

Honing O.D. of pistons for a variable delivery pump.

FOR VICTORY PRODUCTION

**SAVE TIME**

**SAVE METAL**

**SAVE COST**

**IMPROVE QUALITY**



Honing cast iron valve guides on full automatic Hydrohoner with Micr-O-Size control—Production 250 pieces per hour. Average Stock removed, .0015" to .0025"—Size within .0005" tolerance; accuracy within .0001" to .0002"; surface finish within 3 to 5 microinches, r.m.s.

Honing Piston Pin holes (in Piston) on Double Spindle Hydrohoner with Micr-O-Size control.



**AUTOMOTIVE...—**

Microhoning has been adopted in most armament production shops to speed up the final processing operation on vital bearing surfaces.

Microhoning generates final surfaces with the minimum amount of stock removal.

Microhoning saves sufficient processing time and cost in some installations, it is reported—even to pay for the machine in 30 to 40 operating days.

Microhoning controls cutting pressure, speed and motion to produce maximum obtainable quality of generated surfaces.

Write for Bulletins AR60 and AR64 for further details.

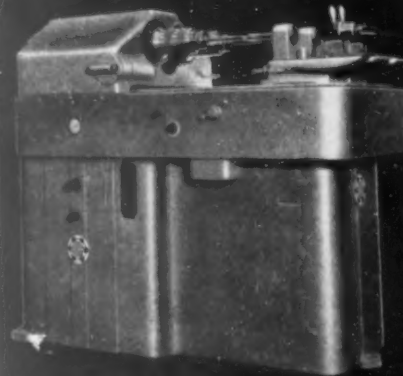


**MICROMATIC HONE CORPORATION**

1345 E. MILWAUKEE AVE.



DETROIT, MICHIGAN



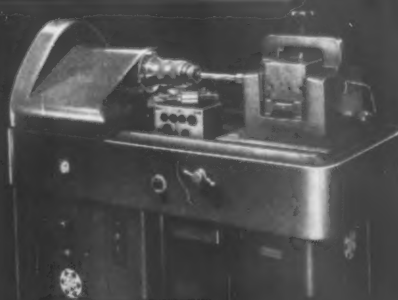
**ORDNANCE...—**

Double Spindle Hydrohoner with Micr-O-Size control for honing gun charger tube bores.



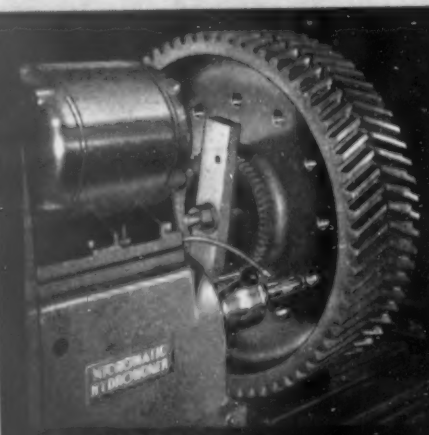
**HYDRAULICS...—**

Honing blind end bores in a variable delivery pump body.



**HYDRAULICS...—**

Honing bores in hydraulic valve body on Micromatic Hydrohoner.

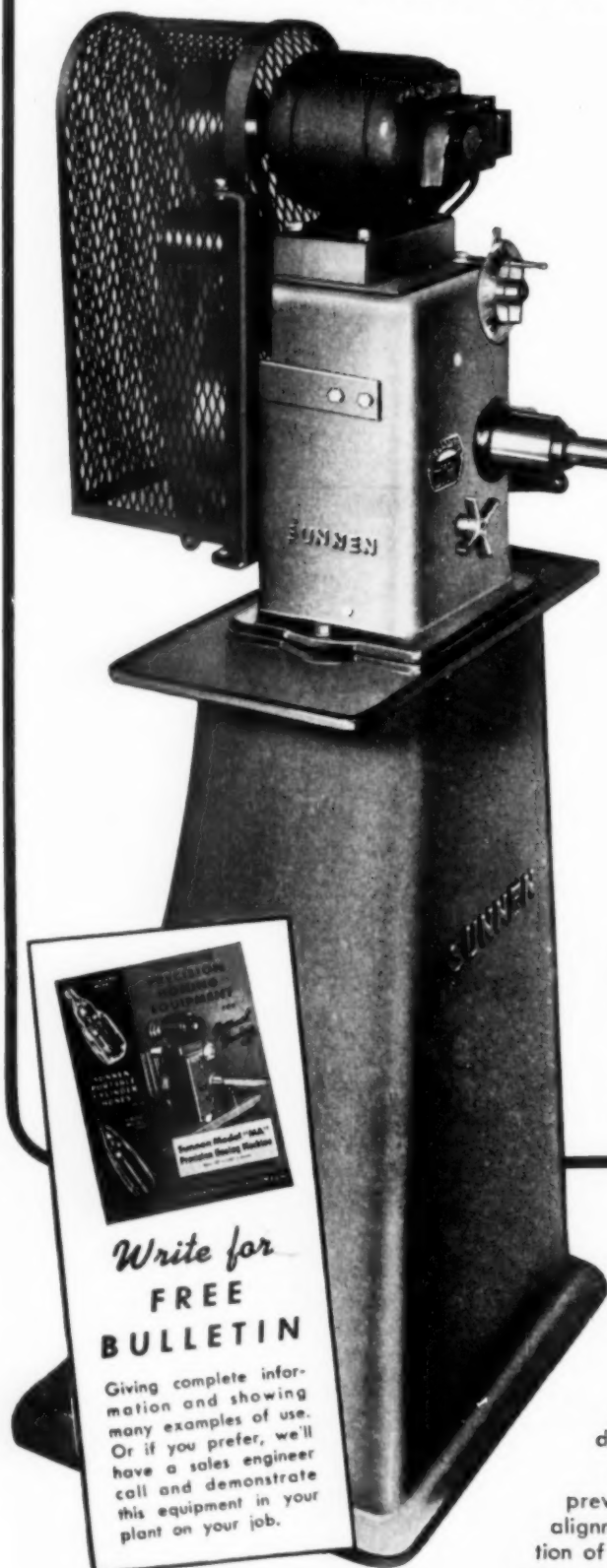


**ORDNANCE...—**

Honing pinion shaft bores in hardened planetary gear for military vehicle.

# The SUNNEN PRECISION HONING MACHINE

*handles jobs like these faster, more accurately, at lower cost*



**Write for  
FREE  
BULLETIN**

Giving complete information and showing many examples of use. Or if you prefer, we'll have a sales engineer call and demonstrate this equipment in your plant on your job.



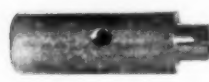
Bronze Valve. The Sunnen method of honing is used to secure a high finish and accuracy.



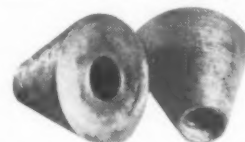
Inner Bearing Ring "Accurately removes last 'tenths' of stock."



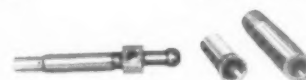
Aluminum Aircraft Link "produces high finish without bell-mouthing."



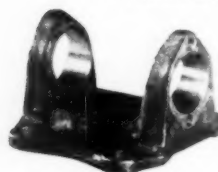
Diesel Engine Fuel Injector Cylinder "So accurate that a piston can be fit within .00005" inch."



Cones for Wheel Balancing Machine "Accurately align hones two interrupted surfaces."



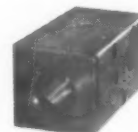
Airplane Engine Parts accurately honed to a super-smooth finish.



"Strict alignment maintained between two holes."



Drawing and Blanking Die "Saves time in producing smooth base metal finish."



Saved time in producing a smooth accurate finish on this bronze remote control valve body.



"Produced an extremely accurate and glass-like finish."

Aviation Hydraulic Cylinder made of Aluminum-Alloy. Improves the quality of the bearing surface. An extremely smooth surface-finish is secured.



Mild Steel Clevis. Honing was used to correct errors of previous machining and maintain true alignment of the two bearing surfaces of this clevis.



Hardened Steel Inner Bearing Race honed to .00005" limit. Surface finish improved; errors of out-of-roundness eliminated.



Aircraft Valve Tappet Roller. 4-Micro finish.

**S**olve your problems of finishing internal cylindrical surfaces with this inexpensive, yet accurate, honing machine. Relieves big internal grinders for other jobs. Can be set up and work located in a minute. Does not require skilled labor—workers in "teens" can handle jobs in "tenths."

Range .185" to 2.400"—accuracy guaranteed within .0001". Now being used by hundreds of manufacturers handling important war contracts.

Corrects errors of out-of-roundness or taper caused by previous operations. Produces super-smooth finishes. Maintains alignment established by previous operations. Facilitates duplication of sizes.

**SUNNEN PRODUCTS CO.** 932 Manchester Ave., St. Louis, Mo.  
Canadian Factory: Chatham, Ontario

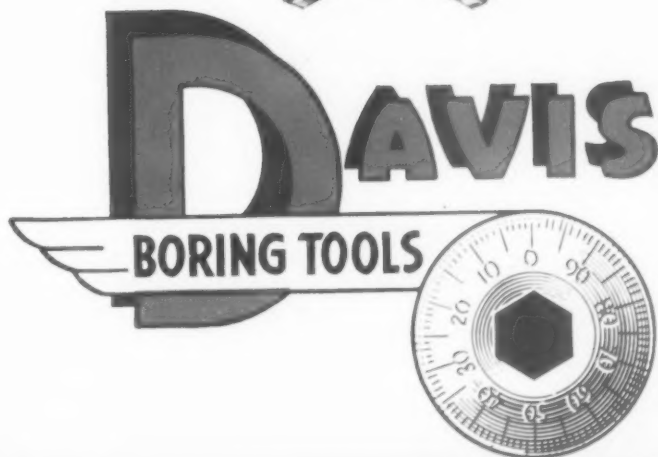
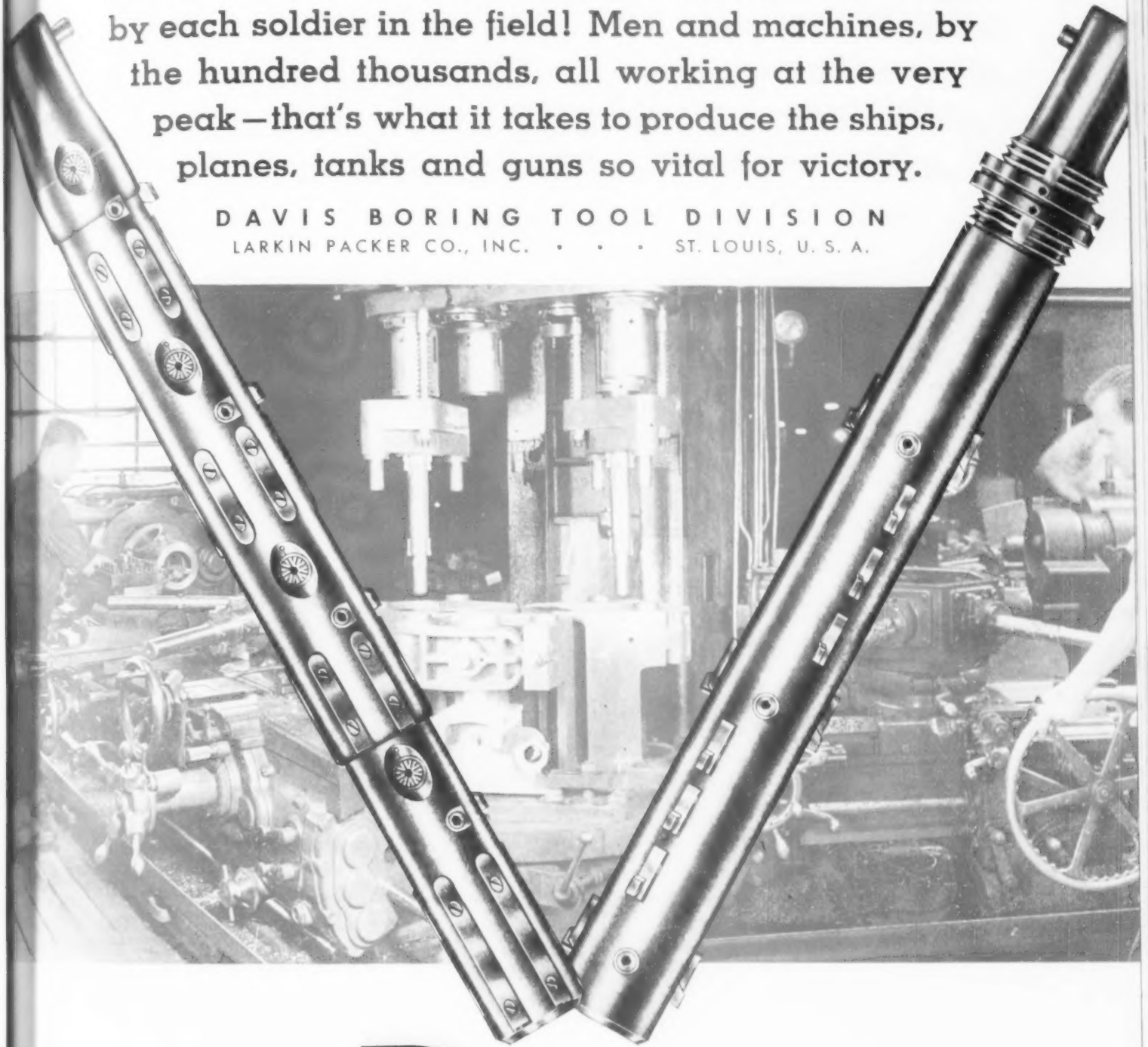
**SUNNEN**



# 18 Men at Work!

18 men must work to produce the equipment needed by each soldier in the field! Men and machines, by the hundred thousands, all working at the very peak—that's what it takes to produce the ships, planes, tanks and guns so vital for victory.

DAVIS BORING TOOL DIVISION  
LARKIN PACKER CO., INC. • • • ST. LOUIS, U. S. A.





# Heald Service Starts Here

Shown above is one aisle of many in our fireproof vault where invaluable engineering records are filed.



Some idea of our engineering capacity and production can be obtained from the Printing Department where on an average every day in the year 4300 square feet of blueprints roll out from the Pease No. 22, while the Ozolid Black & White machine produces 4650 square feet every 24 hours.

The 250,000 drawings carefully filed in Heald vaults represent a tremendous amount of engineering knowledge accumulated through many years in serving industry in precision finishing. Found in these drawings is a quick answer to all kinds of problems in precision grinding and boring . . . in the wealth of machine design developed to meet ever-changing finishing requirements . . . in the special machine details that have solved countless special problems . . . in the hundreds of fixtures designed for quicker and more efficient chucking . . . in the infinite variety of tool applications. Today, this backlog of engineering data has become a source of service tremendously valuable in keeping production rolling . . . for these 250,000 drawings as interpreted by 250 Heald Engineers form an encyclopedia of production know-how immediately available for helping all our customers solve every kind of problem involving precision internal grinding, surface grinding and precision boring.

**THE HEALD MACHINE CO. WORCESTER, MASS. U. S. A.**

## BEHIND THE SCENES with DoAll

Metal and alloy parts cut on the DoAll Contour Machine are so smooth and clean that they are all ready for use **without further machining** or finishing. Think of the time this saves! Then, to add to its versatility, DoAll production engineers have developed valuable **plus** equipment to handle all kinds of heavy work and jobs of irregular shapes—hydraulic work feeds, rip fences, ball-bearing work slides, work holders and guides, supports for long, heavy parts, mitering attachments for cutting tubing and channel stock at any angle, circle cutting fixtures, illuminating magnifying glasses, and others.

### AIRPLANE AMBULANCES

The U. S. Air Corps has a fleet of mobile machine shops for repairing damaged planes right on the spot—the shop goes to the plane. Each "ambulance" contains a DoAll Machine as part of its essential equipment.

### FOR THAT "BETWEEN MEALS" SLUMP

For the past two years, Continental has been distributing free vitamin tablets regularly to employees and since early this spring, they have also provided free drinks during the middle of each morning and afternoon. Here's a typical month's consumption:

Milk	36,755 bottles
Tomato Juice	4,575 "
Orange Juice	888 "
Total	42,218 "

It is estimated that it takes a herd of 26 cows chewing their cud for 30 days to produce the milk. Who says Continental isn't looking out for the farmer?

### KINGPIN OF SPEED CONTROLS

The Speedmaster was originally invented to provide infinitely variable speed (6 to 1 ratio) for DoAll Contour Machines. It wasn't long, however, before manufacturers of machinery in other fields discovered that this compact little unit was adaptable to their machines also. Today Speedmasters are controlling machine speeds in plants making hats, textiles, paper boxes, wire and metal products, bakery goods and even for cleaning tons of walnuts. Send for the new 40-page Handbook telling all about the many and varied applications of the Speedmaster.



● Uncle Sam tells us that every ounce of metal saved is vital right now. DoAll saves tons and tons by slicing off any metal or alloy as clean as a whistle. Makes no difference whether it's internal or external cutting, this ultra-modern production machine follows a hairline without any waste. Uncut portions of metal or alloy are usable.

Compare DoAll's economic performance with that of shapers, millers and other machines which reduce tons of metal to chips.

### FASTEST METHOD TO REMOVE METAL

In production plants everywhere, DoAll is wrecking former time schedules—doing important sawing and filing jobs in one-half, one-quarter or one-eighth former time.

Let a factory trained man come to your plant with a DoAll and prove its metal and time saving ability to you.

**A Size for every Job . . .** There is a DoAll to do your particular job faster and better. Throat capacities from 16" to 60". Priced from \$1000 to \$5000, including motors.

### NEW BOOK

"DoAll on Production" shows DoAlls at work in leading plants. An interesting story told in pictures. Send for copy.



## CONTINENTAL MACHINES, INC.

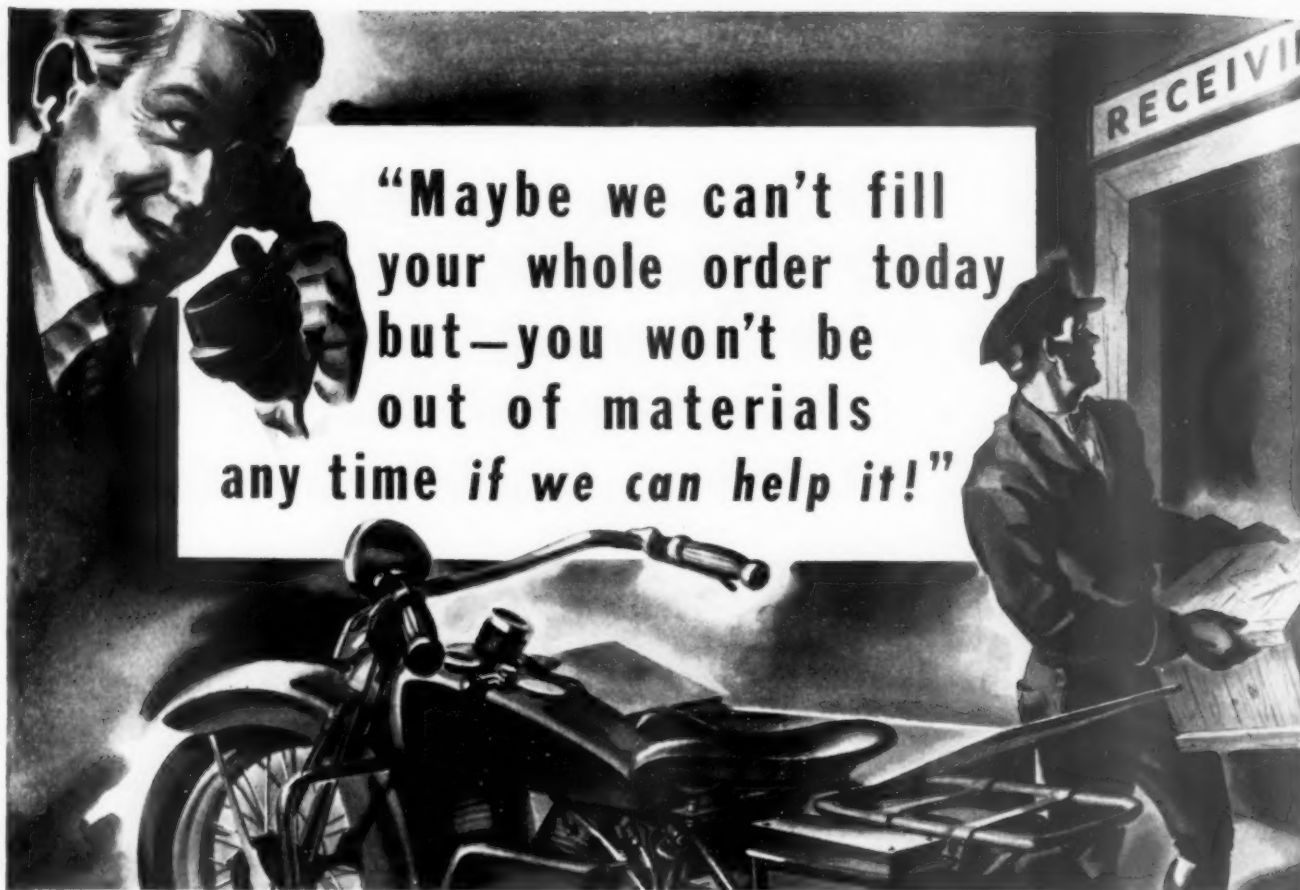
1304 S. Washington Ave.  
MINNEAPOLIS, MINN.

Associated with the DoAll Company, Des Plaines, Ill., Manufacturers of Band Saws and Band Files for DoAll Contour Machines

### THE "DoAll" USES 3 KINDS OF BANDS







This is your Industrial Supply Distributor's pledge to help you keep your contracts moving with never the loss of a minute's production if it can be avoided. It means he will put forth every resource to keep you furnished with the vital supplies and equipment you must have to keep up your share of the War Effort.

It will make your work easier, simpler, less costly, to buy through your own nearby Mill Supply House, because:—

**1**—Mill Supply Houses do their buying from literally hundreds of Manufacturers and are trained to keep hunting for what you need until they find it.

**2**—Their facilities are organized to handle all the complicated details of contacting, buying and expediting deliveries from scores of these suppliers, *every day*.

**3**—They buy outright large stocks

of supplies they know you will need—sometimes 25,000 or more separate items—then stock them for quick delivery to you.

**4**—They know Priorities and can help you obtain essential materials in cases where you do not have blanket authorization.

**5**—If they cannot complete your order in one delivery they usually can rush out an emergency supply saying "here's enough to keep you going—more soon."

Take your own Mill Supply Distributors into your buying confidence—let them serve you as a vital source of supply not only now, but permanently.

Our own great faith in them is based upon the many years' experience in which they have represented us as Distributors of Cle-Forge High-Speed Drills and Peerless High-Speed Reamers nationwide.

This incident is typical of the unusual services that many Mill Supply Distributors are rendering their customers during the Emergency.

**The CLEVELAND TWIST DRILL COMPANY**  
 1242 EAST 49<sup>th</sup> STREET  
 CLEVELAND  
TRADE MARK REG. U. S. PAT. OFF. AND FOREIGN COUNTRIES  
 30 READE ST. NEW YORK    9 NORTH JEFFERSON ST. CHICAGO    650 HOWARD ST. SAN FRANCISCO  
 6515 SECOND BLVD. DETROIT    LONDON - E. P. BARRUS, LTD. - 35-36-37 UPPER THAMES ST. E.C.4



"CLEVELAND" DISTRIBUTORS EVERYWHERE ARE READY TO SERVE YOU

# AUTOMATIC CHUCKING EQUIPMENT

## is mobilized and busy

## in the Battle of Production

Many Potter & Johnston Automatic Chucking Machines are enlisted in America's Machine Army in an "all out" effort to serve production.

This physically fit equipment—fast, powerful and easily handled—has been designed and built to anticipate today's needs for maintained accuracy and intensified production of duplicate parts.

The versatility of P&J equipment is evident from the types of jobs on which it is making big time savings in the arsenals of democracy. Airplanes, airplane engines, tanks, Bofors guns, 90 mm anti-aircraft guns, machine guns, adaptors for shells, the American Oerlikon gun are typical armament products on which P&J equipment is being extensively used.

Potter & Johnston's obligation in the battle of production does not cease when a machine goes on the production line. Our engineers are on the alert at all times to better the best yet attained and if possible achieve the impossible in productivity. We welcome this opportunity to serve.



Photo by U.S. Army Air Corps

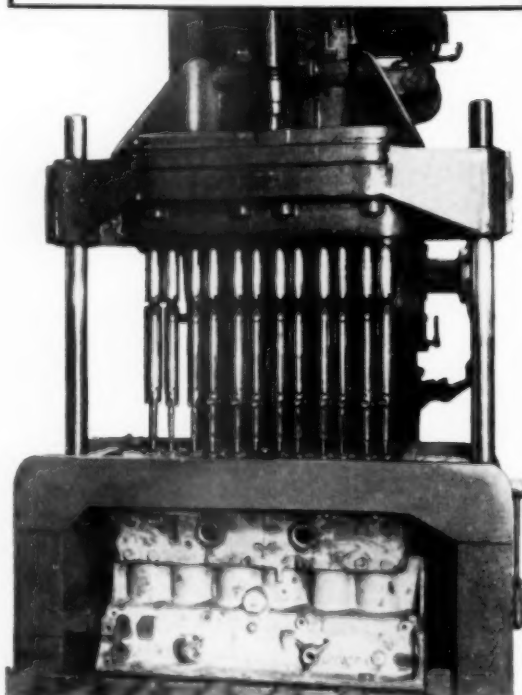
### The POTTER & JOHNSTON MACHINE CO.

PAWTUCKET . . . . . RHODE ISLAND

# Compensate for TOOL WEAR and UNEQUAL TOOL LENGTHS on single and multiple spindle jobs with MIDWEST ADJUSTABLE EXTENSION HOLDERS



MIDWEST ADJUSTABLE EXTENSION TOOL HOLDERS in use for FINISH REAMING Operation on Cylinder Blocks in a Detroit Automotive Plant



- ADJUSTMENTS CAN BE MADE IN STEPS OF .001 OF AN INCH.
- OPERATOR CAN MAKE ADJUSTMENTS BY HAND—NO TOOLS NEEDED.
- SET-UP TIME IS REDUCED.
- DESIGN IS SIMPLE, CONSTRUCTION RUGGED. ALIGNMENT ACCURATE.

## HERE'S HOW THEY WORK

Midwest holders are provided with an extremely accurate, ground fit between the sleeve and the shank. A knurled, graduated collar which controls the adjustment is located at the top of the sleeve. A key fixed in the sleeve, with a sliding fit to a keyway in the shank provide a positive drive.

Micrometer, longitudinal adjustment steps of .001 of an inch are made by turning the collar one space on the bevelled edge, graduated scale. The collar holds firmly at all positions of the scale. There are no screws or locknuts to give trouble and, without tools of any kind, the operator can easily make the adjustment by hand.

**MIDWEST TOOL & MFG. CO. • 2364 W. Jefferson • Detroit, Mich.**

END MILLS • SLEEVES • COUNTERBORES • DRILLS  
SPECIAL TOOLS • REAMERS • FORM TOOLS  
CARBIDE TIPPED TOOLS • ADJUSTABLE HOLDERS

*Precision* METAL CUTTING TOOLS



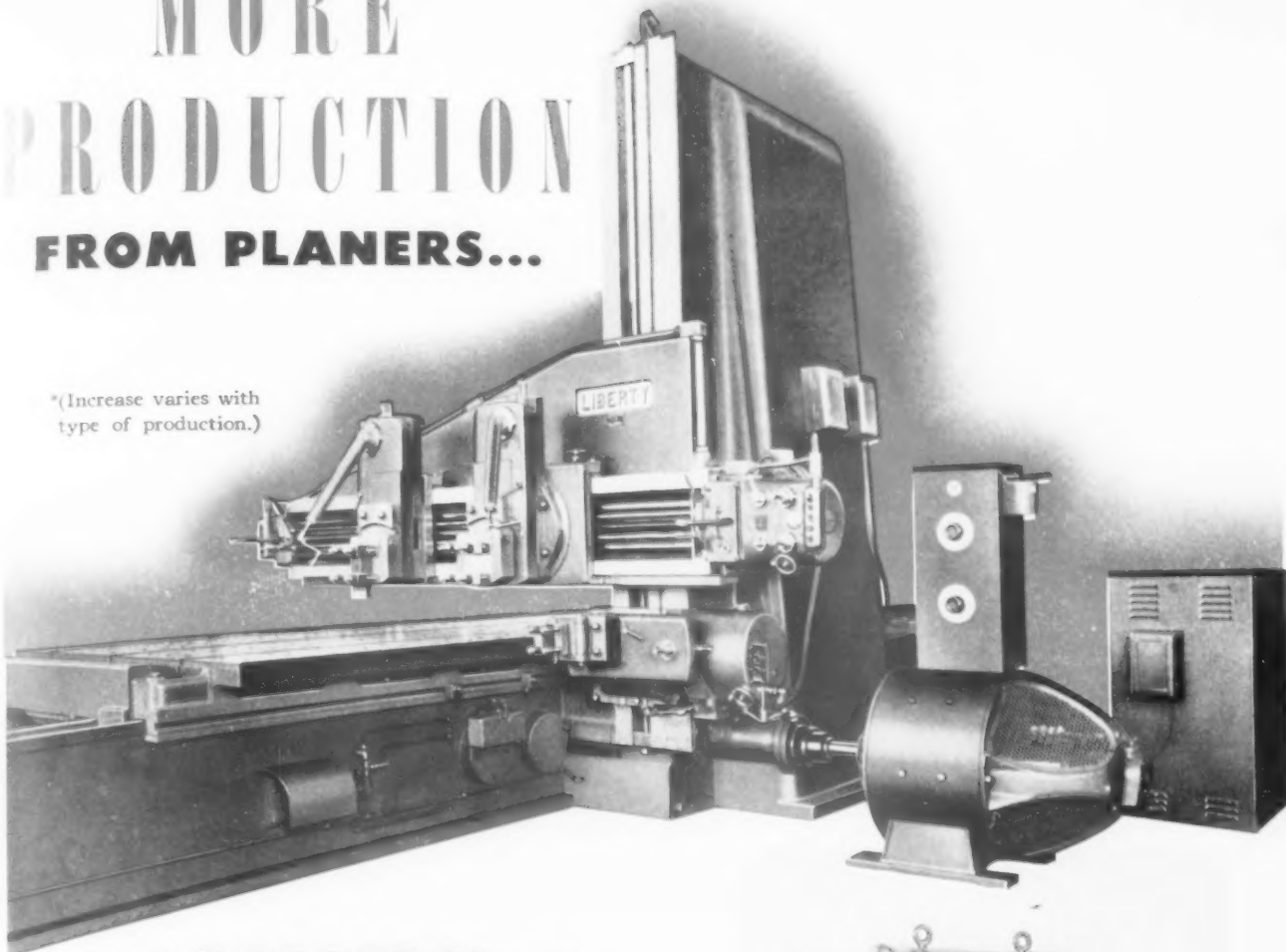


# MORE\*

## PRODUCTION

### FROM PLANERS...

\*(Increase varies with type of production.)



## with **ROTOTROL** and Westinghouse **VARIABLE VOLTAGE DRIVES**

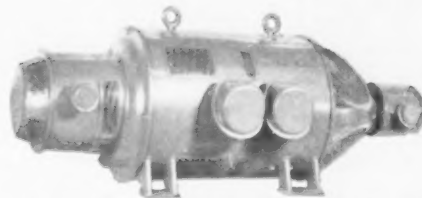
"In our opinion, for equivalent planer construction, a minimum increase in production of 15% can be expected by using a Westinghouse Variable Voltage Drive."

This statement by the general manager of a plant equipped with Westinghouse Planer Drives is more than verified by other users' experiences. Faster return speeds and more accurate stopping are made possible by Westinghouse **ROTOTROL**—a control method that permits faster acceleration and deceleration, and holds the planer motor speed constant over the entire speed range. As a result, **MORE** cutting strokes per minute are obtained.

At the same time, machine outages for maintenance of controls are reduced, because the Westinghouse Variable Voltage Drive requires less than half the usual number of contactors, relays and interlocks used on older types of drives, and involves almost 2/3 fewer electrical operations per planer stroke.

Get the full story on this faster, more flexible, proved planer drive. Check your Westinghouse representative today or write Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., Dept. 7-N.

J-21203



### WHAT THE WESTINGHOUSE VARIABLE VOLTAGE PLANER DRIVE DOES

- Gives more cutting strokes per minute. Faster acceleration and deceleration. Speeds reversing time.
- Reverses accurately to a line—provides accurate control for planing up to shoulders or in blind pockets.
- Provides closely regulated speed at any setting over entire range, regardless of voltage or load fluctuations.
- Cuts machine outages for control maintenance.



# Westinghouse

## VARIABLE VOLTAGE DRIVES



# 5-METHOD

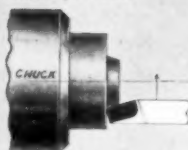
COMPLETE TOOL SERVICE  
for MAXIMUM PRODUCTION

*for many machining operations  
on most materials*

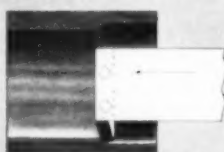
## A Few Applications of Standard Vascoloy-Ramet Carbide Tools



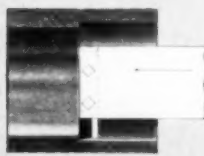
Ordinary Turning  
Styles 11 and 12



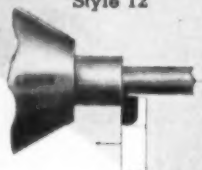
Ordinary Facing  
Style 12



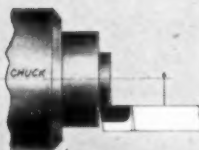
Boring  
Style 12



Boring to a Square  
Shoulder  
Style 6



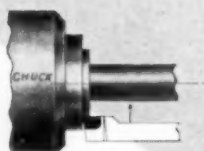
Turning to a Square  
Shoulder  
Style 3



Facing to a Square  
Shoulder  
Style 6



Turning Close to  
Chuck  
Style 1



Facing  
Style 2

Method One of the Vascoloy-Ramet Tool Service offers a wide variety of standard carbide-tipped tools. They are finished ground and used as they are. They are also modified to meet the requirements for simple form tools.

While the accompanying illustrations show only a very few applications of some of the Vascoloy-Ramet Standard Tools, the boring, turning, and facing operations that are being done on cast iron, aluminum, bronze, and steels with these standard tools, is practically countless. Because of the many styles and sizes, and the choice of several general purpose grades of Ramet Carbide Blanks, simplified tooling practice recommends this Method One wherever possible.

These standard tools will simplify and speed up your tooling work. Write for your copy of bulletin VR 421 for full particulars.

# VASCOLOY-RAMET CORPORATION

NORTH CHICAGO, ILLINOIS

DISTRICT SALES AND SERVICE IN PRINCIPAL CITIES

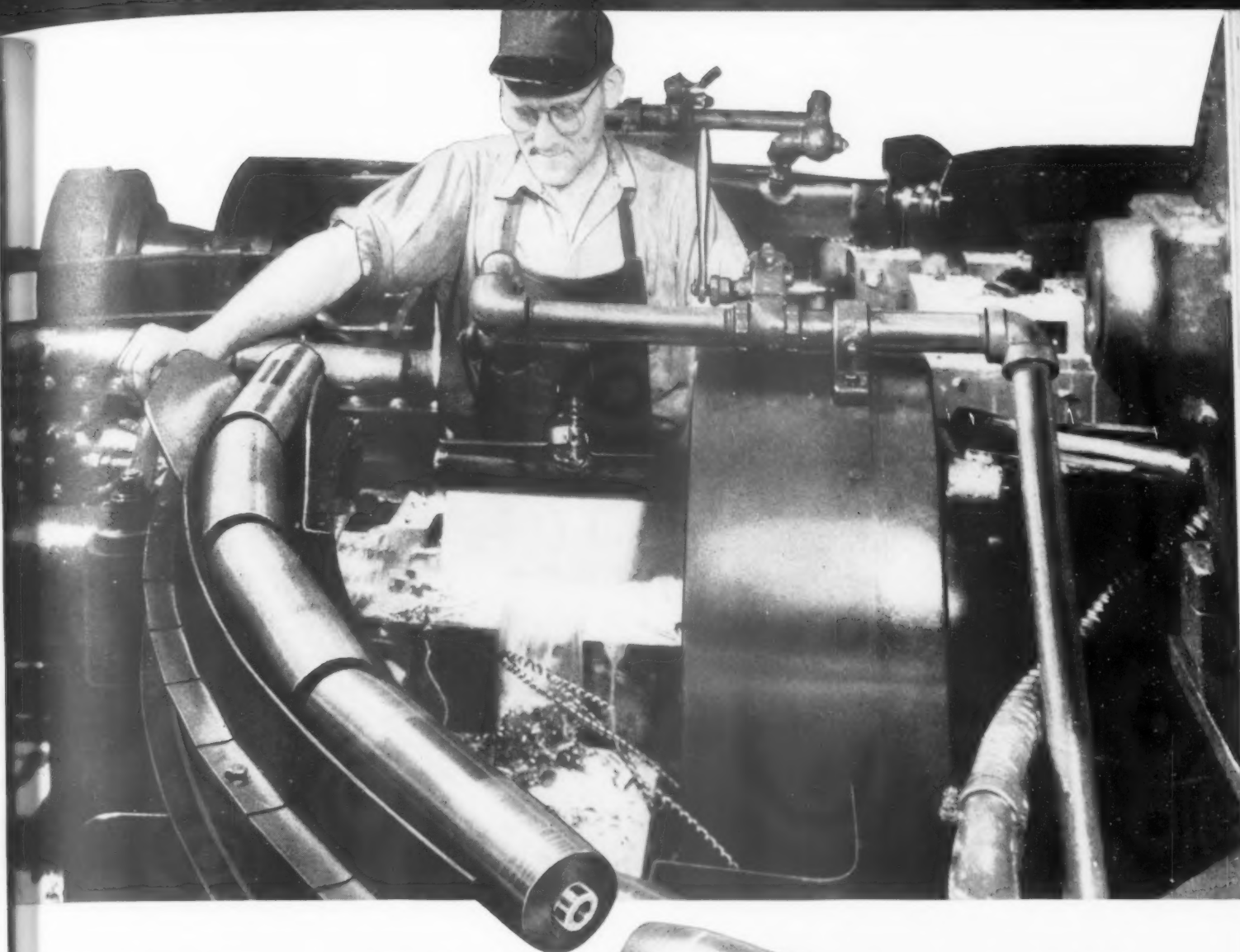
IN CANADA: Carbide Tool & Die Company, Ltd., Hamilton, Ont.

4249

TANTALUM-TUNGSTEN CARBIDE  
FOR TOOL SERVICE..... Specify

Vascoloy  
**RAMET**

**TOOLS**  
TANTUNG "G"



## SHORT CUTS TO VICTORY!

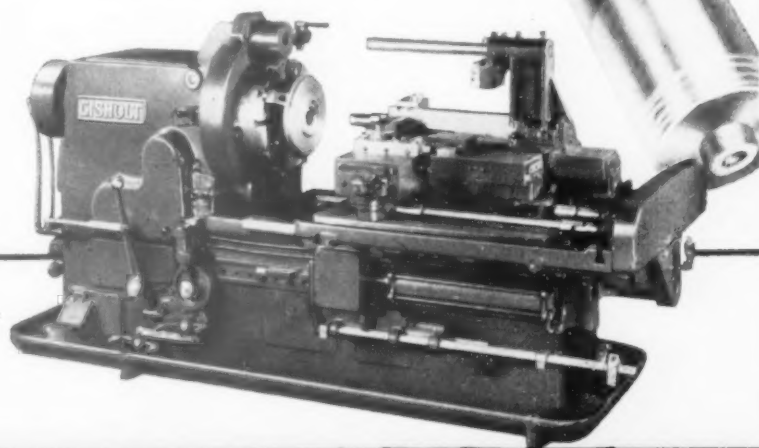
● Faster and faster flows the stream of war production. Faster and faster come the materials from American arsenals and industrial plants.

In the forefront of the production battle today are such time-saving, man-saving machine tools as the Gisholt Simplimatic . . . putting to vital use the peace-time lessons of mass production for millions.

Here, with but little training, one man can out-produce more than two, three, or even four skilled operators on hand-operated, non-automatic machines. Here is high-speed production that short-cuts the road to Victory.

Gisholt Machine Company, 1229 East Washington Avenue,  
Madison, Wisconsin

*THE GISHOLT SIMPLIMATIC is entirely automatic in operation, designed for multiple cutting, with the ability to maintain accuracy at high-cutting speeds. Extremely simple to operate, it can be tooled to handle a wide variety of cylindrical parts.*

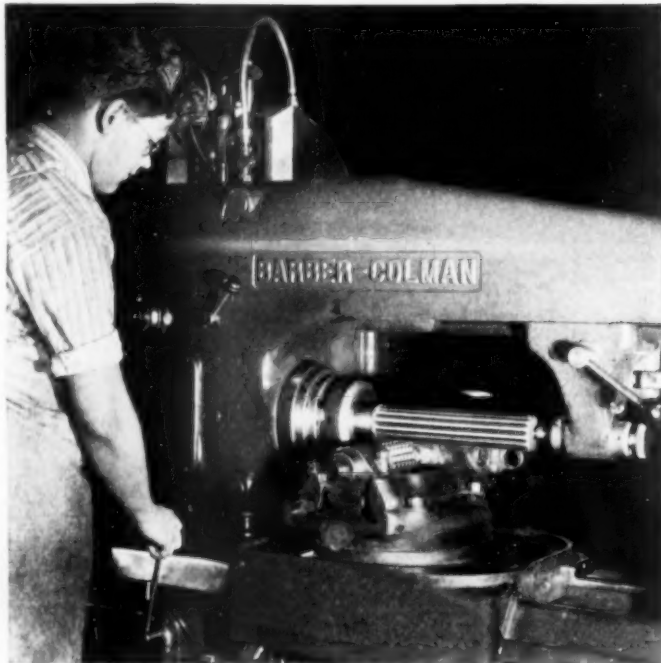


LOOK AHEAD . . . KEEP AHEAD . . .  
WITH  
GISHOLT IMPROVEMENTS  
IN METAL TURNING

TURRET LATHES · AUTOMATIC LATHES · BALANCING MACHINES



# LOWER COSTS ON TOUGH SPLINE HOBGING



## BARBER-COLMAN TYPE "D" HYDRAULIC HOBGING MACHINE

PERHAPS the most significant feature of this machine in comparison with others of comparable size and capacity, is the fact that it uses a 10 h.p. motor while most of the others use a 5 h.p. motor. This greater driving power means greater metal-removing capacity, and greater production. Greater production is of little value without accuracy and rigidity to meet modern gear-tooth tolerances, so you will find in the Type "D" many distinctive construction features which insure maintenance of a high degree of accuracy. Furthermore, to provide a feed range with infinite variations, for advancing the carriage, for setting and clamping the overhanging arm, and to reduce operator fatigue, HYDRAULIC drive is used. Lead remains a direct product of change gears used.

### HOLDS CLOSE LIMITS . . .

The part shown in the above illustration is a tractor axle shaft which must be able to stand heavy shock loads, as well as transmit a considerable amount of power. These conditions require a tough and accurately-machined spline shaft. To insure accuracy, the splines are hobbed after heat treatment to 269-302 Brinell. On the Type "D" machine, production is one shaft every 30 minutes, and the splines are parallel within .004" measured over rolls. This is an excellent example of the production and accuracy obtainable with a Barber-Colman Type "D" Hobbing Machine.

### DATA ON THIS SPLINE JOB . . .

Material — 1050 H.R. Steel.

Hardness — 269-302 Brinell.

Splines — 16 splines, 14-7/8" long, 2.121" O.D., 1.791" root dia., involute form, 30° P.A.

Hob Speed — 66 R.P.M.

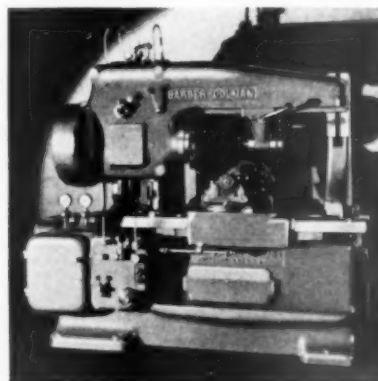
Hob — B-C 3-1/4" x 4" x 2" taper hole, ground, topping, single-thread.

Feed — .082" per rev. of work.

Production — 48 min. per piece, floor-to-floor.

Pieces per Hob Sharpening — 36.

Accuracy — Splines parallel within .000"-.004" measured over .280" rolls. Across individual splines within .001". Spline profile tolerance .0015".



Further details and full specifications on the Barber-Colman Type "D" Hobbing Machine are given in descriptive circulars which will be furnished on request. Ask for Bulletin F1477-1 or consult your Barber-Colman representative.



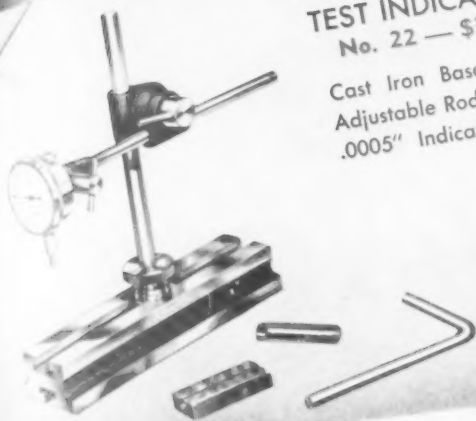
**BARBER-COLMAN PRODUCTS**  
HOB, HOBGING  
MACHINE, HOB  
SHARPENING MA-  
CHINES, REAMER,  
REAMER SHARP-  
ENING MACHINE,  
MILLING CUTTER,  
SPECIAL TOOLS

## BARBER-COLMAN COMPANY

General Offices and Plant 213 Loomis Street, Rockford, Illinois, U. S. A.

### TEST INDICATOR No. 22 — \$30

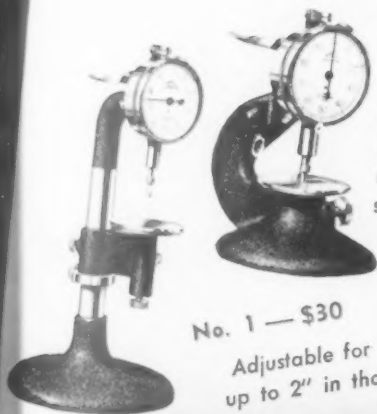
Cast Iron Base and  
Adjustable Rods, with  
.0005" Indicator.



### COMPARATORS

No. 2  
\$22.50

Smallest of sev-  
eral models to  
measure in thou-  
sandths.



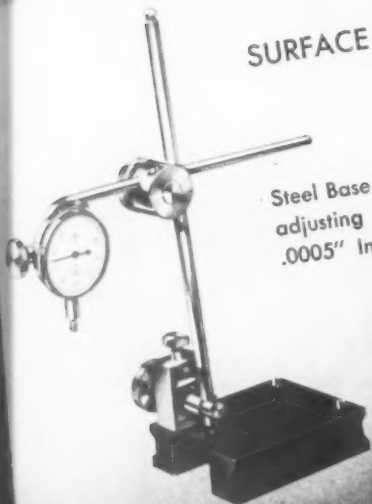
No. 1 — \$30

Adjustable for measuring  
up to 2" in thousandths.

### SURFACE GAUGE

No. 22B  
\$38.50

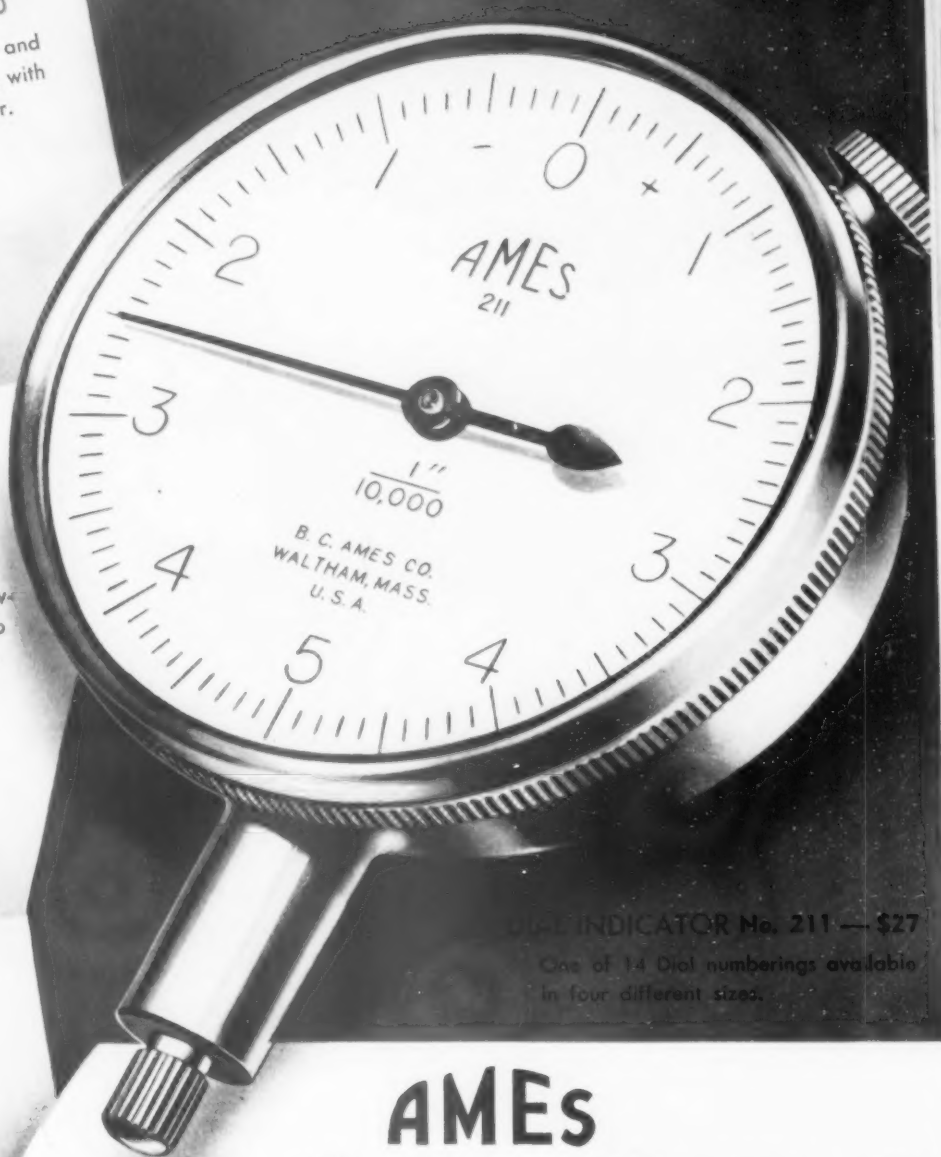
Steel Base and quick  
adjusting Rods, with  
.0005" Indicator.



### COMPARATOR

No. 13 — \$30

Cast Iron Base 8"  
square, with .001"  
Indicator adjust-  
able to 6".



DIAL INDICATOR No. 211 — \$27

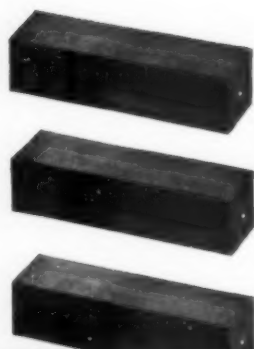
One of 14 Dial numberings available  
in four different sizes.

# AMES GAUGES

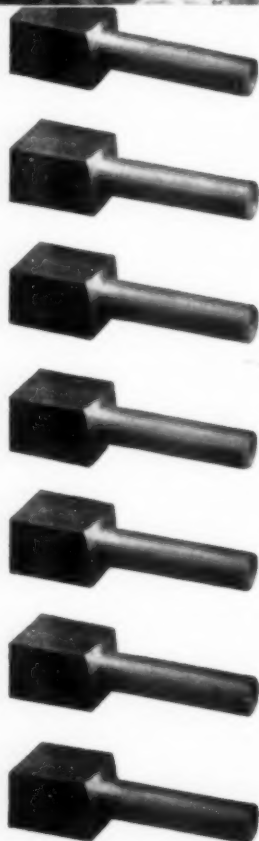
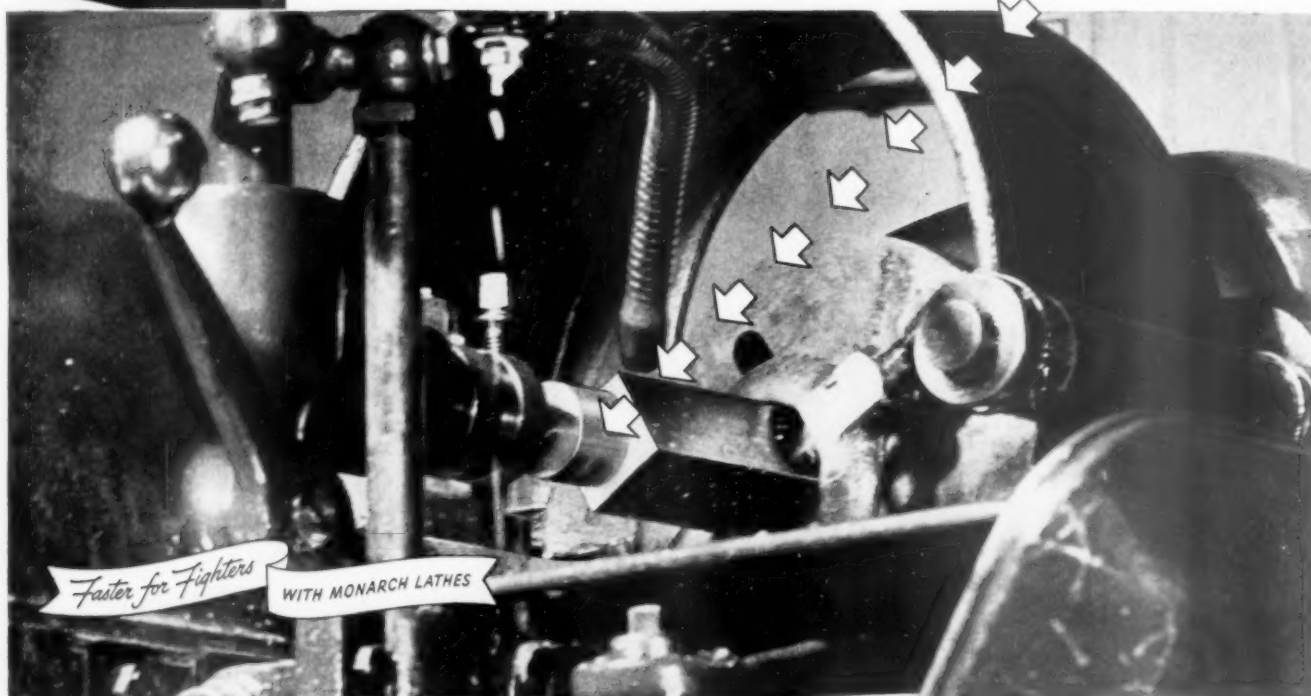
The many models shown in the new Ames catalog represent the best in design, materials and workmanship that this famous maker has offered during 47 years of experience. They are the most accurate, sensitive and durable instruments of their kind, yet this higher quality costs you no more. Just a few of the more popular numbers are shown here . . . why not send for complete catalog today?

**B. C. AMES CO.,  
WALTHAM, MASS., U.S.A.**

Branch Offices: 423 New Center Bldg., Detroit — 420 Lexington Ave., New York



# 1948 BLOWS PER MINUTE



## ... but the Monarch Lathe can take it!

Turning square stock with an interrupted cut puts a heavy strain on the lathe—especially at high speeds. The stud illustrated is cut from  $1\frac{7}{8}$ " square stock (SAE-1020), with a Tungsten Carbide tool, at a speed of 487 RPM—creating 1948 hammer blows per minute.

But the Monarch Model W Lathe takes this work in its stride. Its design and structural strength provide the rigidity to take this interrupted pounding action. Bearings of adequate size support the main spindle and other shafts. The bearing area of the carriage on the bed, and the bearing area of the compound rest to the carriage are designed in correct proportion to provide the rigidity to stand up under such heavy punishment.

Yet the same lathe that takes, without flinching, these rough interrupted cuts performs the finest of finishing operations with unfailing accuracy.

Therein lies much of the utility of Monarch Lathes of today—which you can continue to depend upon to do your turning work—tomorrow.

THE MONARCH MACHINE TOOL COMPANY • • • SIDNEY • OHIO



COVER THE TURNING FIELD

THE TOOL ENGINEER



# Here's the Way to Do the Internal Grinding of TUNGSTEN STEEL Cartridge Dies

*These NORTON  
DIAMOND WHEELS  
are the Answer*



**Rapid Production**  
**Close Dimensional Accuracy**  
**High Surface Finish**

**FOR ROUGHING—Norton 100S-B100 Diamond Resinoid**

Grinds cartridge dies of dense, wear-resistant alloy steels such as tungsten at a rapid rate, many times faster than ordinary vitrified wheels. Wheel wear is so slight that hole size and straightness can be held to close tolerances without difficulty.

**FOR FINISHING—Norton 500-B50 Diamond Resinoid**

Produces a surface finish comparable to that obtained by lapping and in a fraction of the time.

If you are making tungsten steel cartridge dies it will pay you to consider Norton Diamond Wheels for the internal grinding job. Consult your Norton abrasive engineer or write direct.

**NORTON COMPANY, WORCESTER, MASS.**

W-883



**NORTON ABRASIVES**

# GORTON PANTOGRAPH DOES 5 OPERATIONS ON INDEX PLATE... *with Unskilled Operator*



## GORTON

### 2-DIMENSIONAL PANTOGRAPH

### ENGRAVING MACHINE COMPLETES OPERATIONS

### FROM SOLID STRIP MATERIAL IN 1½ HOURS...

● Multiple operations on large runs of duplicate parts can be handled quickly and accurately on Gorton Pantograph Engravers. On this job the manufacturer uses Gorton Single Flute High-Speed Cutters operating at 9,200 r.p.m., and maintains an accuracy of  $\pm .0015''$  while profiling. The remainder of the operations are performed with a  $\frac{1}{4}''$  diameter straight shank cutter running at comparable speeds.

The brass index plates made from  $\frac{3}{16}''$  strip material come to the Gorton Pantograph Engraver with three drilled and countersunk holes.

The operations performed are shown on the front and back views of the completed plate.

In addition to work of this nature, the Pantograph Engraver may be used for engraving dies, molds, dials, flat and curved work, and other general engraving, profiling and lettering work.

Gorton Engineers, specialists in engraving, die, mold and stamp cutting, and super high-speed milling, will be glad to make recommendations on your work—without obligation.

## PANTOGRAPH DATA

**MACHINE**—Gorton 3-Z Pantograph Engraver.

**PART**—Index Plate.

**MATERIAL**— $\frac{3}{16}''$  Engraver's Brass.

**QUANTITY**—300 Pieces.

**CUTTER**— $\frac{1}{4}''$  dia. Straight Shank Single Flute End Mills.

**OPERATION**—Engraving, Marking and Profiling complete from solid strip.

**HOLDING**—Special Jig with "T" Slot Clamp.

**FEED**—Manual.

**SPEED**—Top Speed—9200 r.p.m.

**TIME**—1½ Hours Complete.

**ACCURACY**— $\pm .0015''$ .

WRITE FOR

## FREE CATALOG No. 1580-A

covering Gorton Pantograph Engraving Machines and Attachments. Also covers other Gorton engraving machines for special purposes.



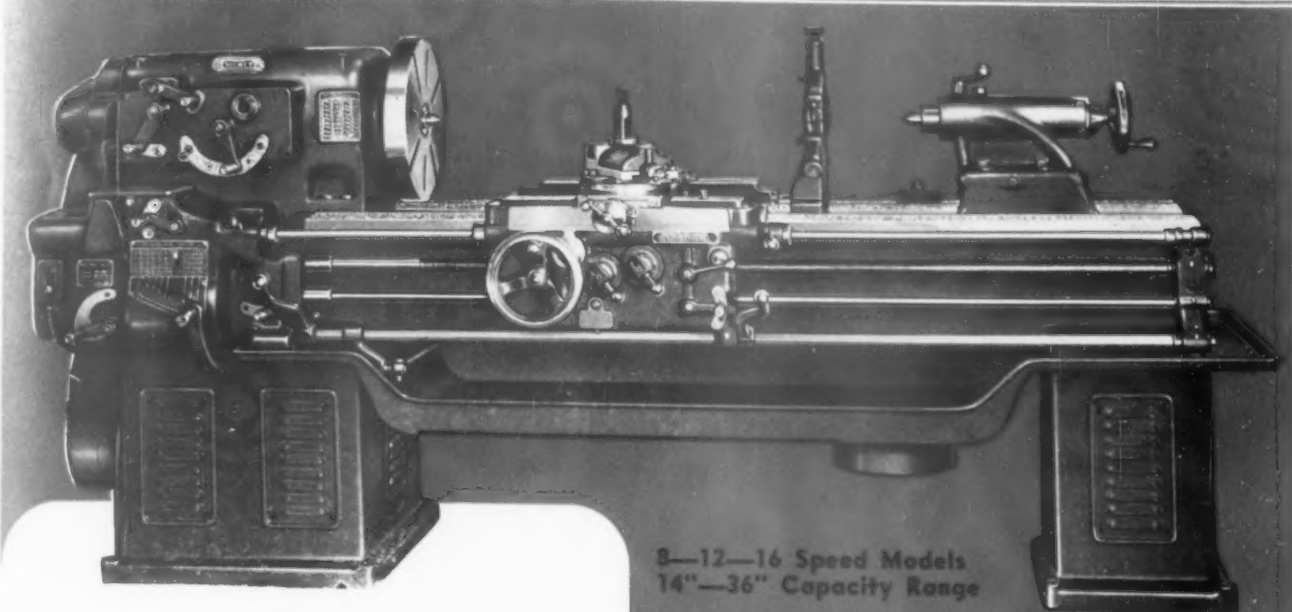
# GEORGE GORTON MACHINE CO.

1322 RACINE STREET, RACINE, WISCONSIN, U.S.A.

SPECIALISTS IN ENGRAVING, DIE MAKING AND SUPER-SPEED VERTICAL MILLING

# SIDNEY LATHES

BRING MODERN DESIGN TO WAR RUSHED INDUSTRY



8—12—16 Speed Models  
14"—36" Capacity Range

A typical example of the modern design features in Sidney Lathes is the

## CARRIAGE AND COMPOUND REST

Neoprene wipers, unaffected by oil, wipe all chips and dirt from the ways, preventing scoring, excessive wear and maintain original accuracy for years to come. The cross feed and compound screws are furnished with COMPENSATING nuts. Tapered accurately fitted gibs, properly placed, are provided to take up for wear. A micrometer stop on the cross feed provides an adjustable depth stop for turning or for internal and external thread chasing.

For further details on this or other models fully descriptive bulletins are available.



**The SIDNEY MACHINE TOOL Company**  
SIDNEY U.S.A. OHIO





# W.F. & JOHN BARNES GUN BARREL MACHINES



← Six-spindle vertical rifle barrel drilling machine for .30 and .50 calibre rifle barrels.

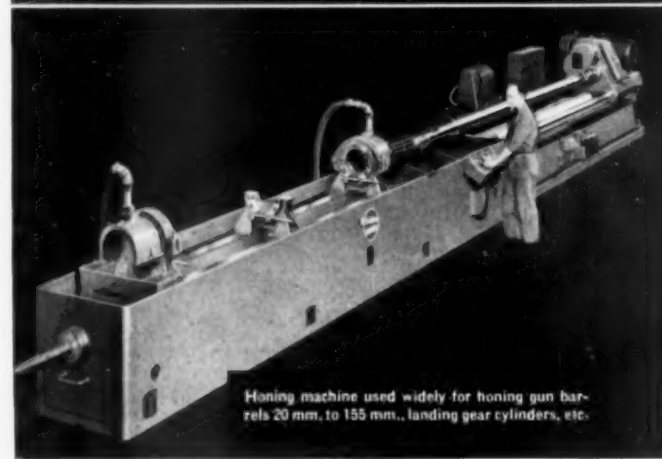
→ Six-spindle vertical deep hole drilling machine for drilling 20 mm. gun tubes from solid.



Single-spindle deep hole drilling machine for rifle barrels, aircraft parts such as shafts, gear blanks, non-symmetrical parts, etc. Capacity: Drilling from solid . . . 1" max. dia. Core drilling or reaming . . . 1-1/2" dia. Stroke — up to 48".




Two-spindle deep hole drilling machine for .30 and .50 calibre rifle barrels, non-symmetrical parts, diametrically balanced parts such as cam and crankshafts, boring bars, etc. Stroke — up to 48".



Honing machine used widely for honing gun barrels 20 mm. to 155 mm., landing gear cylinders, etc.

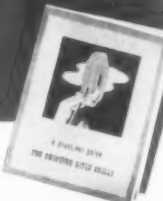


Two-spindle deep hole drilling, boring, and reaming machines. Capacities: — Drilling from solid — 1" to 5" dia. Stroke — up to 16".



## FREE

● Descriptive literature on any of the machines shown here will be sent promptly upon request.  
New Free Guide for grinding .30 and .50 Calibre Rifle Drills by hand also available,—send for your copy today.



## W. F. and JOHN BARNES

325 SOUTH WATER STREET • ROCKFORD, ILLINOIS, U.S.A.



**Information about alloys...**

## **GEARED**

**to industry's war needs**

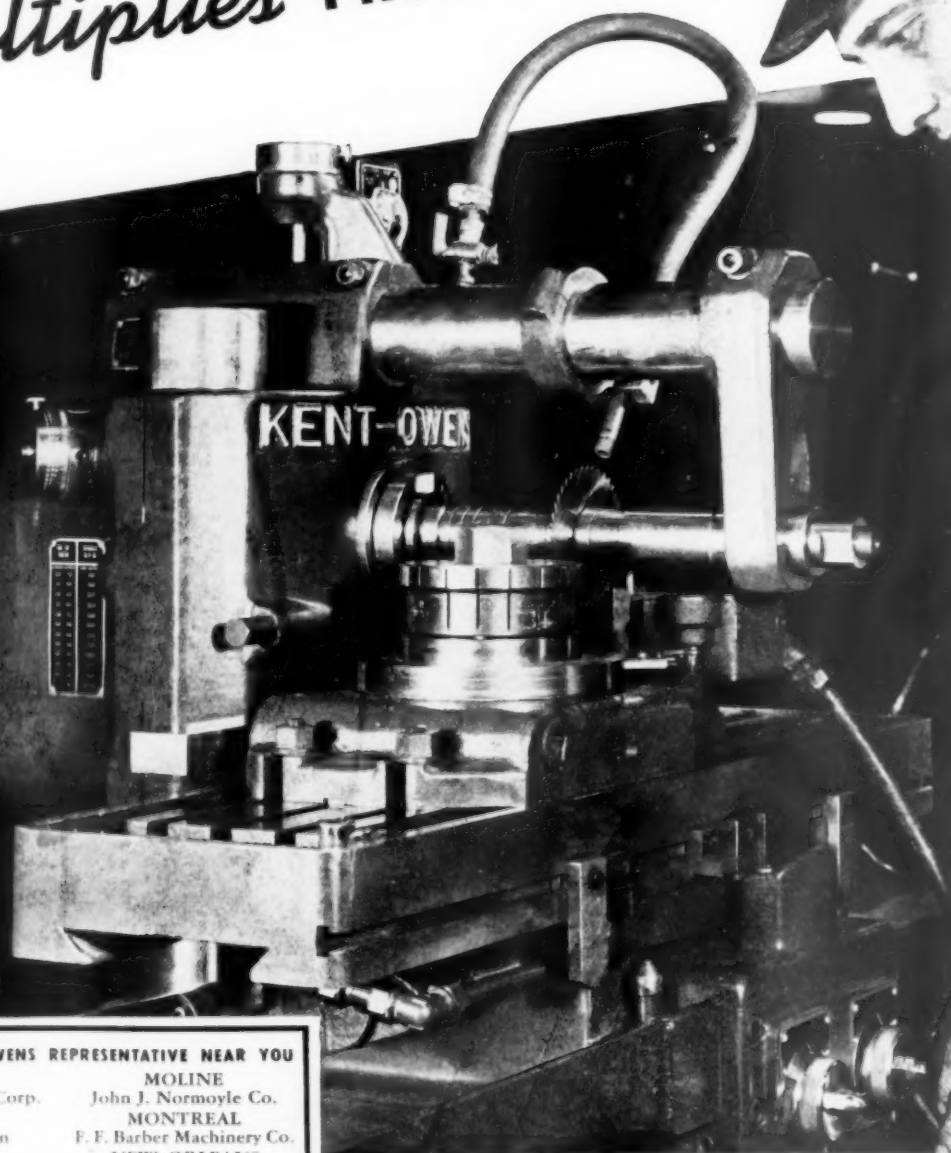
Converted to wartime tasks, American industry requires and calls upon us for information about alloys. Quickly available are practical answers to your questions about the selection, fabrication and uses of ferrous and non-ferrous materials containing Nickel. • Even before World War I, this Company pioneered studies of special alloys that provide added strength, toughness and wear-resistance. Our years of experience have been digested into printed reports and data sheets that help you save time and material. • Now, with all Nickel allocated where it may best speed Victory, our studies of alternative materials and processes become especially useful. • Upon request, personal assistance from our technical staff supplements the data in our printed bulletins.

# **NICKEL**

**THE INTERNATIONAL NICKEL COMPANY, INC.** 67 WALL STREET  
NEW YORK, N. Y.

# AUTOMATIC INDEX MILLING

## *Multiplies* PRODUCTION!



### THERE'S A KENT-OWENS REPRESENTATIVE NEAR YOU

BOSTON General Machinery Corp.	MOLINE John J. Normoyle Co.
BUFFALO Don W. Patterson	MONTREAL F. F. Barber Machinery Co.
CHICAGO Neff, Kohlbusch & Bissell	NEW ORLEANS Oliver H. Van Horn Co., Inc.
DALLAS Hamilton-Huster Machinery Co.	NEW YORK Wilson Brown Company
DAYTON Gosiger Machinery Co.	PHILADELPHIA Calco Machinery Company
DETROIT A. C. Haberkorn Machinery Co.	PITTSBURGH Barney Machinery Co.
GRAND RAPIDS Joseph Monahan	ROCHESTER F. W. Schiefer Machinery Company
HOUSTON Oliver H. Van Horn Co., Inc.	SAN FRANCISCO C. F. Bulotti Machinery Co.
INDIANAPOLIS Oatis-Booth Machinery Co.	SEATTLE Star Machinery Company
KANSAS CITY Eichman Machinery Co.	ST. LOUIS Blackman & Nuetzel Machinery Company
LOS ANGELES Eccles & Davies Machinery Company	SYRACUSE J. F. Owens Machinery Co.
MILWAUKEE Neff, Kohlbusch & Bissell	TORONTO F. F. Barber Machinery Co.
	WALKERVILLE F. F. Barber Machinery Co.

● Shop men everywhere are calling on Kent-Owens for Automatic Index Milling Equipment.

Kent-Owens has had wide experience in engineering a great variety of fixtures for this type of work.

If you have operations that lend themselves to automatic index milling, contact Kent-Owens to *multiply your production*.  
Kent-Owens Machine Company, Toledo, Ohio.

*Call on* **KENT-OWENS**  
*for Milling Machines*



*Your Answer*

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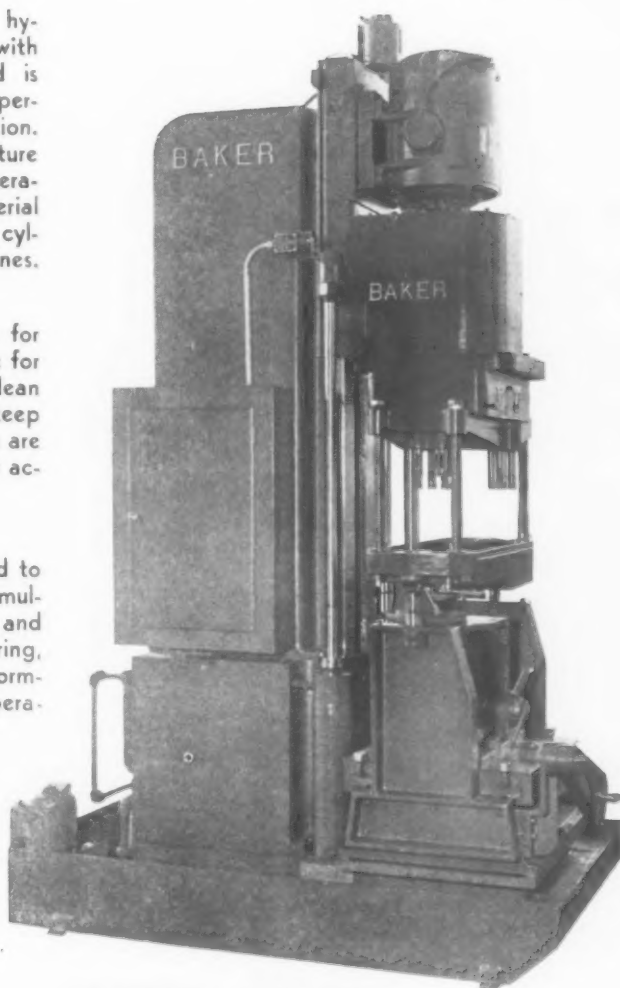
TOP PERFORMANCE and PRODUCTION

## BAKER "Cleanline" DRILLS

This powerful vertical hydraulic feed machine with multiple spindle head is your answer for top performance and production. Its special cross index fixture is very successful for operations in magnesium material oil sump as used on 9 cylinder aircraft radial engines.

"CLEANLINE" stands for better shop appearance for this machine offers a clean design and is easy to keep clean for all major units are fully enclosed yet easily accessible.

This machine is adapted to heavy duty single and multiple spindle operations and is suited to drilling, boring, counterboring, facing, forming, and recessing operations.



**MODEL 26-HO**

WRITE FOR NEW CIRCULAR AND ENGINEERING DATA SHEET

**BAKER BROTHERS INC., TOLEDO, OHIO**

DRILLING — BORING — TAPPING — KEYSEATING — CONTOUR GRINDING MACHINES

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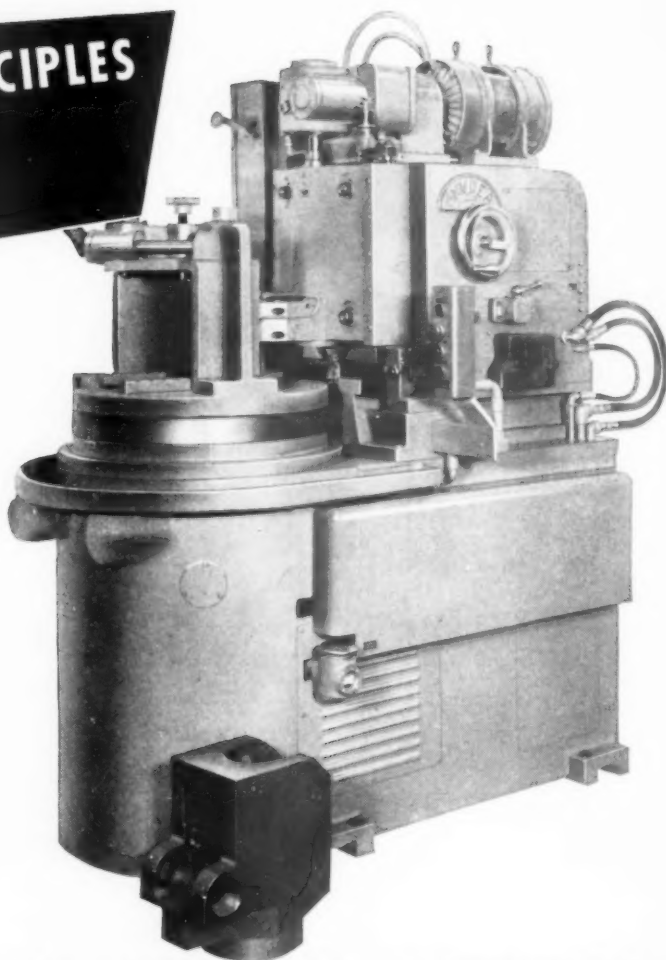
**AUTO PRODUCTION PRINCIPLES  
APPLIED TO MAKING  
GUN PARTS!**



## **SNYDER SPECIAL HYDRAULIC MACHINE**

*for*

### **MILLING EXTRACTOR TRUNNION POCKETS IN BREECH RING**



This Snyder special machine demonstrates how the needs of the hour have transformed a highly specialized "tool shop" operation into an automobile production type of operation with corresponding gain in volume.

The operation consists of cutting kidney shaped slots and is done without special attachments such as tracers or duplicators.

The work cycle of the machine is as follows. When the work piece is loaded in the locating fixture and the cycle starting button pressed, the tool spindles start to rotate and the tool spindle slide advances into position while the fixture table starts to oscillate the work through a short arc which controls the shape of the slot.

The depth of the slot is cut in steps which are adjustable from a few thousandths of an inch to 1/32" deep per oscillation of the table. The

oscillation of the table and the tool advance are hydraulically operated and electrically controlled. (The hydraulic step-by-step tool advance can be disconnected and the tool advance accomplished manually, if desired.)

Because of the semi-automatic work cycle, the production of this machine is a great deal higher than ordinarily accomplished by previous methods.

Noteworthy are the stops for the main slide which are bevelled at 45° and located one on either side of the ways. These not only stop the slide but also hold it down on the ways for greater rigidity.

This type machine is also available in larger sizes for larger parts.

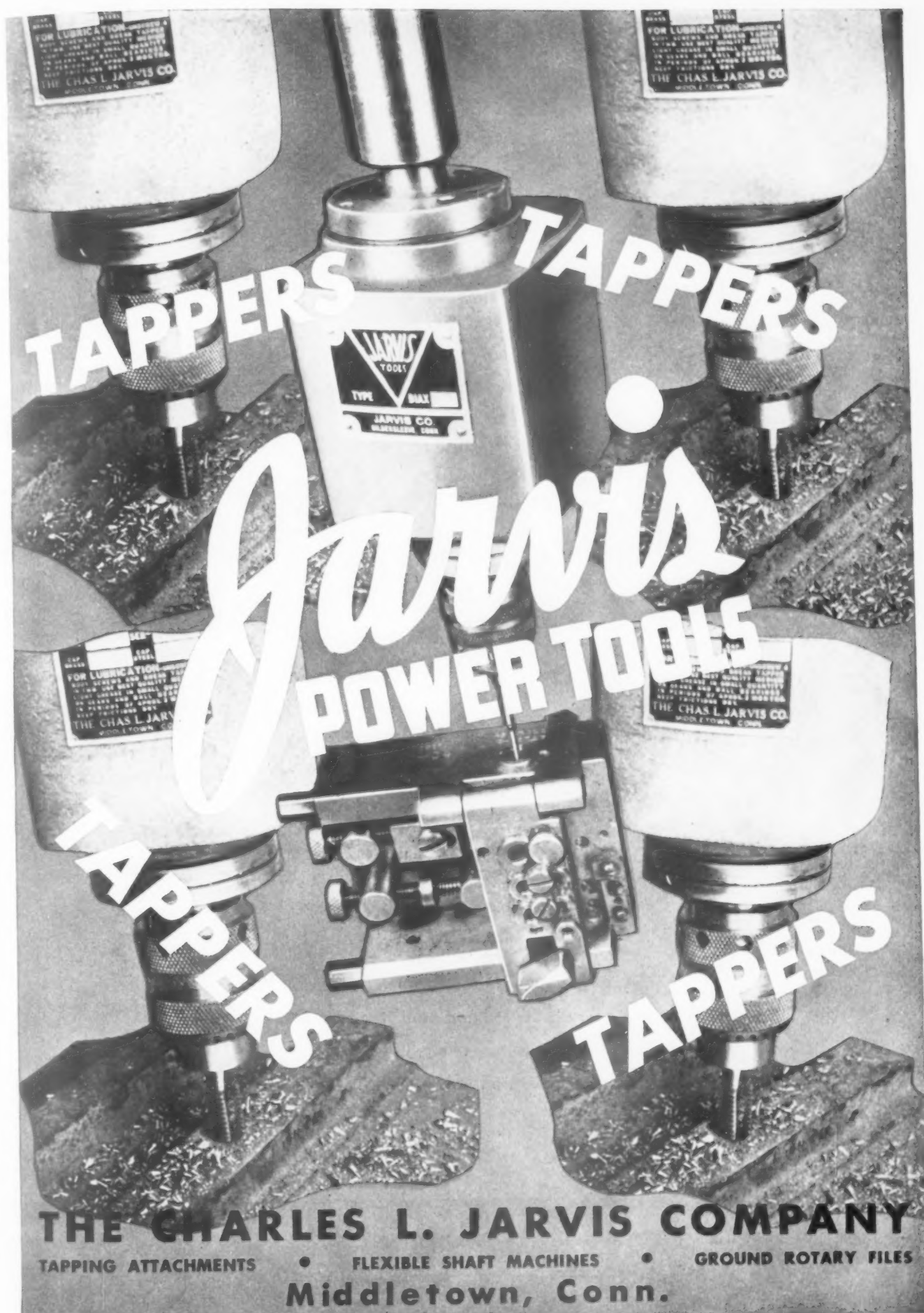
If greater production is one of your problems we invite your inquiries.

# **SNYDER**

**TOOL & ENGINEERING CO.**

3400 E. Lafayette Ave. • Detroit

*designers and builders of machinery  
for HIGH production at LOW unit cost*



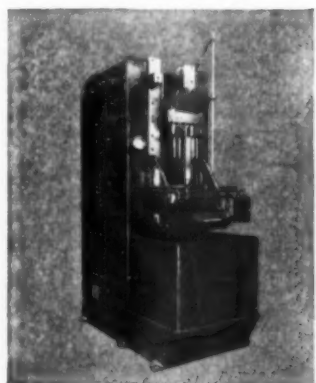
**THE CHARLES L. JARVIS COMPANY**

TAPPING ATTACHMENTS • FLEXIBLE SHAFT MACHINES • GROUND ROTARY FILES

**Middletown, Conn.**



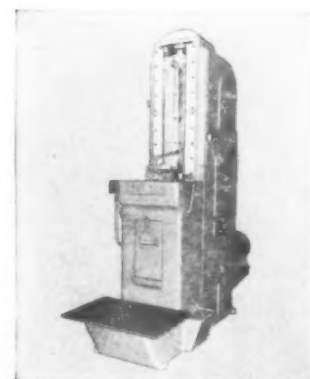
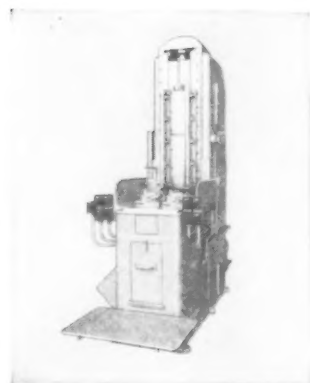
# FACTUAL BROACHING INFORMATION *on War jobs*



AMERICAN has satisfactorily handled all types of War Production broaching jobs. We have furnished broaching machines and complete tooling for broaching bearing cage openings, transmission and differential gears, crankshaft bearings, fuse parts for shells, connecting rod mating surfaces and rifling of various size cannon from the 105 MM down to and including the 20 MM.

If you have a production problem involving the possible use of broaching we may be able to help you. Forward part prints for proposals on Broaching Machines and Tooling and Production estimates on your war job. There is no obligation.

**"BROACH FOR VICTORY"**



**AMERICAN BROACH & MACHINE COMPANY**

**ANN ARBOR, MICHIGAN, U. S. A.**

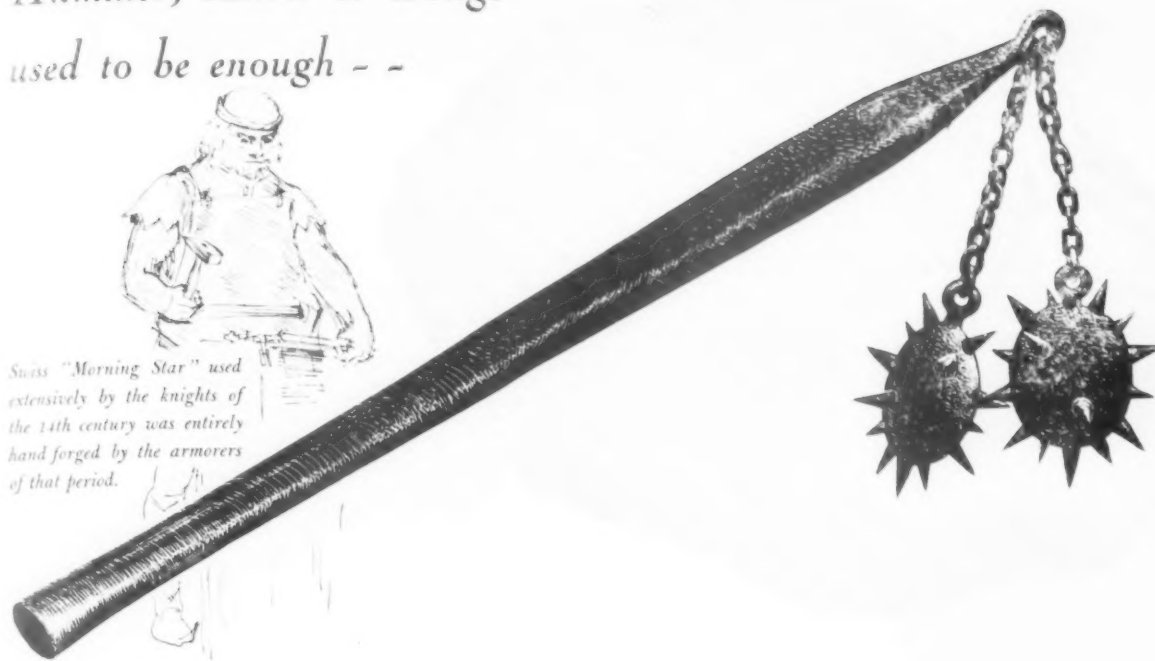
**BROACHING MACHINES, PRESSES, BROACHING TOOLS, SPECIAL MACHINERY**



## Hammer, Anvil & Tongs

used to be enough - -

Swiss "Morning Star" used extensively by the knights of the 14th century was entirely hand forged by the armorers of that period.



## - - BUT PRODUCTION OF MODERN WEAPONS DEMANDS DEPENDABLE TOOL STEELS

Tool steel plays an essential part in every step of the complex manufacturing operations required to complete the tanks, planes, ships, guns and all the other implements of modern warfare. Tool steel performance must be dependable to avoid loss of production, time and the waste of materials. Coppco tool steels are making good dependability records. We would like to discuss your tool steel requirements with you.



COPPERWELD STEEL COMPANY • WARREN, OHIO

THE WILL TO MAKE  
GOOD STEEL



# "DIFFICULT" JOBS WANTED!

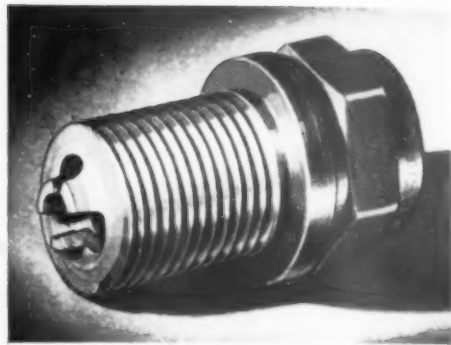


FIGURE 1

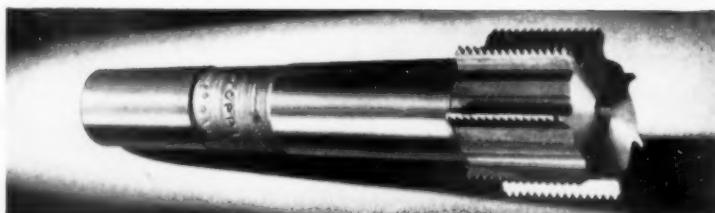
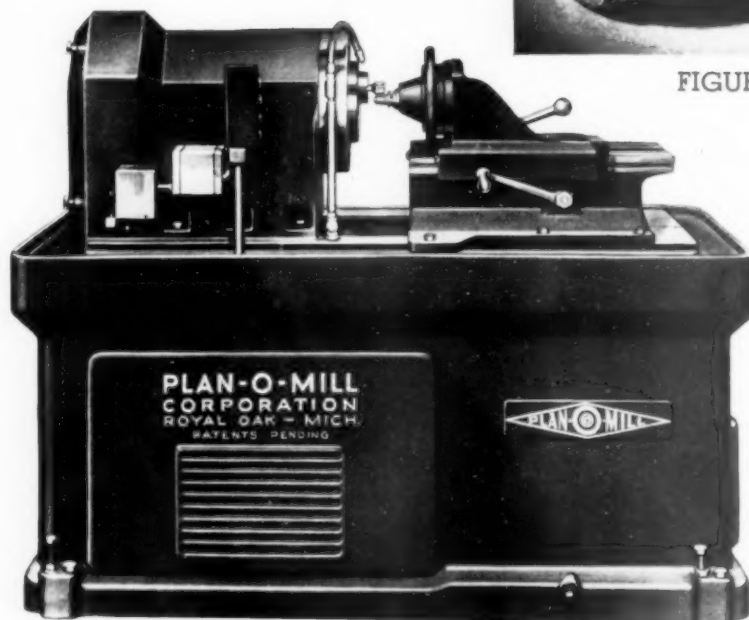


FIGURE 2

● Have you a "difficult" job of threading or cylindrical forming—one where *both* high speed and high precision are required?

Are you interested in saving time—saving material—saving cutters?

Then Plan-O-Mill is your machine!

• • •

In one nationally famous arms plant, spark plugs (Fig. 1) are being threaded by Plan-O-Mill with a cycle time of 35 seconds per piece.

Unusual accuracy is obtained. The part does not revolve—all motion is confined to the milling cutter, which revolves around the work.

Cutter life is good. Worked at a 55 parts per hour rate, cutters on this job produce an average of 400 pieces per grind with about 25 grinds per cutter. The one shown here (Fig. 2) has milled more than 10,000 pieces.

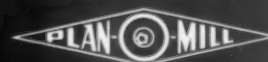
Plan-O-Mill's fast, accurate production makes it the ideal machine for your "difficult" problem.

Write Dept. C for catalog.

## PLAN-O-MILL

### CORPORATION

(FORMERLY THE GORDON-R CO.)



WASHINGTON SQUARE BLDG.  
ROYAL OAK, MICHIGAN



# RIGHT NOW ...for Armament work you can use these Abrasive Finishing Machines

## ☆ DELTA Abrasive Belt Finishing Machine

When you are confronted with an urgent need for increased production in connection with the U. S. armament program—check into the possibilities of these Delta machines. Here is a 6" Abrasive Belt Finishing Machine that is heavy and husky enough to do any of the dozens of sanding, polishing and finishing operations to be found around the average shop, yet which is portable enough to be used just where it is needed. It has found wide acceptance for fining, finishing and surfacing metal and plastic parts. Every feature has been designed to eliminate disadvantages usually found in small belt polishing machines. The frame is heavy and substantial; the adjustments convenient and positive in action; attachments are quickly attached or removed; the machine may be used either vertically or horizontally, as required. It is completely guarded, and dust removal may be made efficiently. It is completely ball-bearing equipped with double-seal bearings, lubricated at the factory for life. There is no rubber covering required on the drums which eliminates one source of replacement expense.



## ☆ DELTA Abrasive Disk Finishing Machine

Designed to meet every requirement for accurate finishing, this Delta Abrasive Disk Finishing Machine is a high-grade tool for high grade work. From its completely machined, true-running 12" disk to its large surface table and the husky spindle of the belt-drive machine, carried on self-sealed ball bearings, it is designed for long life, low power consumption and accurate, dependable results.

Made on two models; one a direct-drive unit employing either a ½ H.P. or a ¾ H.P. ball-bearing motor. The disk in this unit fits directly onto the end of the motor shaft, making the machine completely self-contained. The other model is a belt-drive unit, which makes it possible to use any motor available, to use motors built for odd frequencies or voltages and to vary the speed to suit individual operations.

Dust collector available, making machine adaptable for use in locations where dust is objectionable.

**Send for  
CATALOG**



giving full details and prices on Delta Abrasive Finishing Machines—and also showing full line of Delta drill presses, grinders, band saws, and other Delta low-cost machine tools.

THE DELTA MFG. CO.  
610-H E. Vienna Ave., Milwaukee, Wis.

Please send me Catalog giving full details and prices on Delta Abrasive Finishing Machines, and your full line of low cost machine tools

Name .....

Address .....

City ..... State .....

# Hanna Cylinders

Air and Hydraulic



**SKILLED MECHANICS**  
for 1001 pushing, pulling  
and lifting jobs

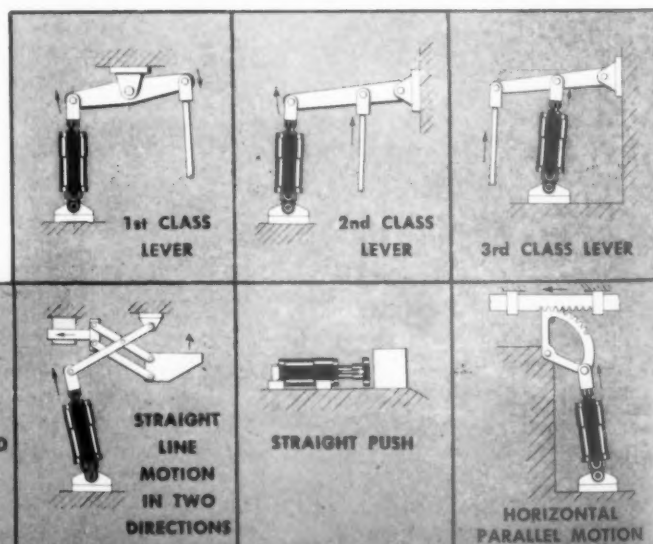
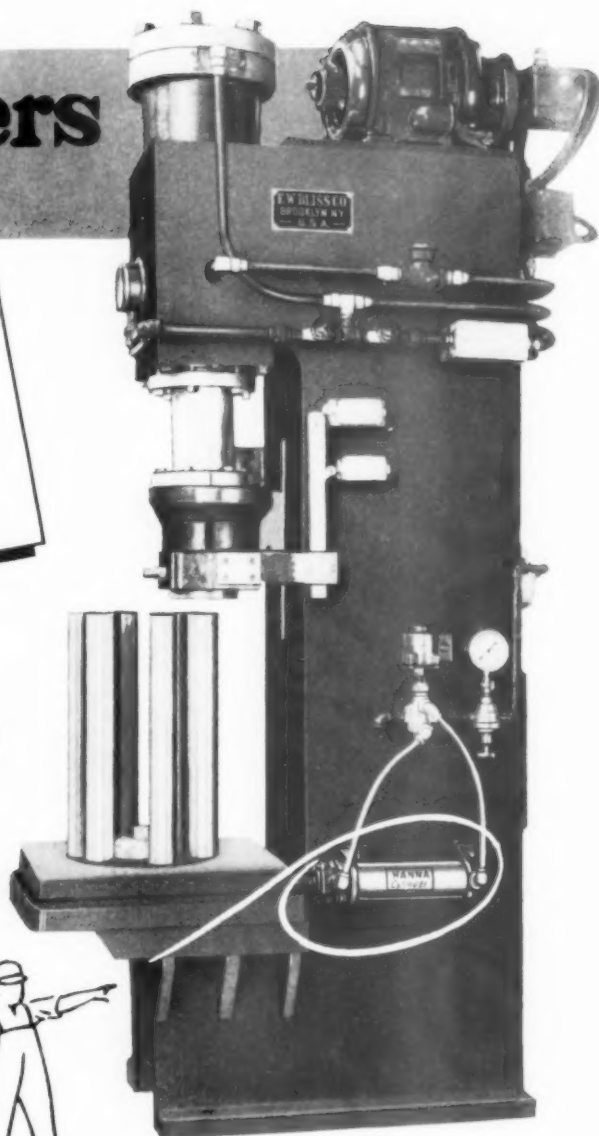
## WHERE CAN YOU USE THEM?

**H**ERE is another example of a Hanna Cylinder at work—performing an important task with its usual dependability and skill. Its job is to actuate a six station dial feed on a Bliss 30 ton Hydraulic Marking Press. It is a smooth-working part of a smooth-working machine.

Similarly in thousands of applications, Hanna Cylinders are used because they are versatile, easy to apply and economical. They simplify and improve the operation of many types of machines and equipment. They can replace, to advantage, manual and semi-skilled labor in a variety of places. They will deliver safe, reliable power, direct or through a lever or toggle, for innumerable jobs that need a pushing, pulling or lifting movement.

There are probably many places in the machines you build or in your plant, where a simple Hanna Cylinder will do the job better at lower cost. The simple illustrations at right and below show a few of the many fundamental mechanical movements where smooth Hanna Cylinder power is used. Don't they suggest adaptations for some particular applications of your own?

Write for Catalog 230 and you will have the full details.



**HANNA ENGINEERING WORKS**

1765 ELSTON AVENUE

CHICAGO, ILLINOIS

Air and Hydraulic  
RIVETERS

Air and Hydraulic  
CYLINDERS

Air HOISTS



# WANTED!



## THE RETURN OF HIGH-SPEED STEEL SCRAP

Believed in hiding in America's vital industrial plants. Description—aged, worn or broken down. To be returned and drafted "in the service." This notice addressed to all users and makers of high-speed steel tools interested in apprehending this slacker.

### REWARD

The satisfaction of knowing you are doing your bit to relieve high-speed steel shortage

**YOUR TOOL  
STEEL MAKER**  
*needs your*  
**HIGH SPEED  
STEEL SCRAP**



- The growing scarcity of steel scrap must not be allowed to hamper America's war effort. The necessity for its prompt salvage is therefore self-evident! Especially is this true of high speed steel, since its high Vanadium content is of such vital importance.

Latrobe is using this space to urge all tool steel users and manufacturers of tools to make every effort to return to your tool steel producer all such scrap. You will help yourself as well as our country by your prompt cooperation.

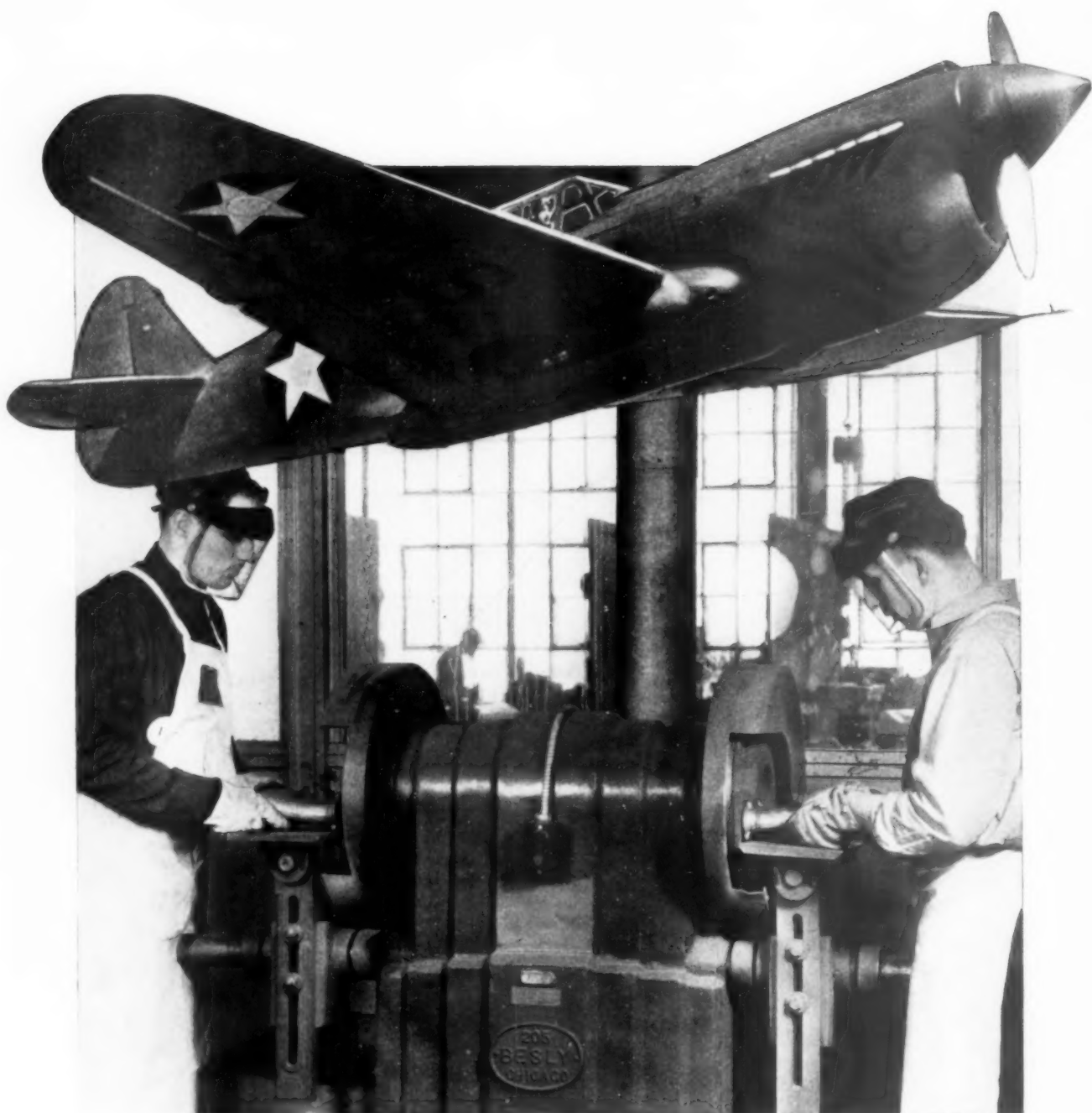
# LATROBE

## ELECTRIC STEEL COMPANY

MAIN OFFICES and PLANT • LATROBE • PA.







[ Ask for your copy of Booklet  
on Besly Titan Steelbacs ]

## BESLY GRINDERS DO THEIR PART

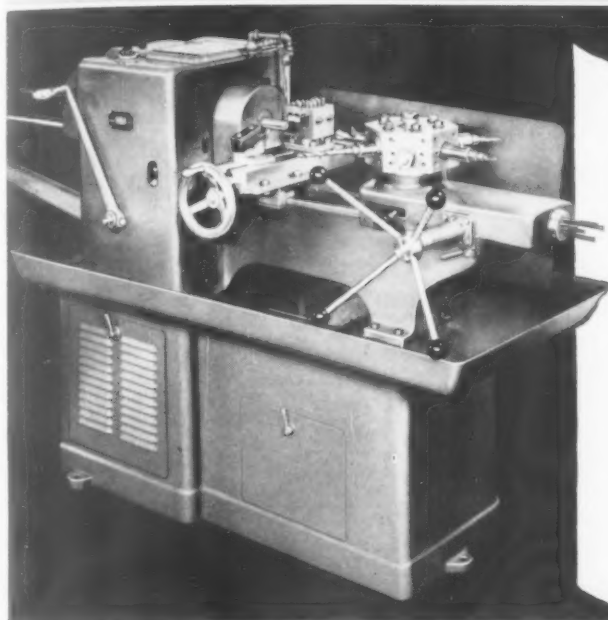
**B**ESLY GRINDERS do their part in the building of Curtiss fighters. The Curtiss-Wright Corporation along with almost every other prominent aircraft manufacturer recognizes that on certain operations a Besly Disc Grinder is the best tool for the job. • Why not investigate the possibilities of Besly grinding in your plant?

**CHARLES H. BESLY & COMPANY**  
118-124 NORTH CLINTON STREET ★ CHICAGO, ILLINOIS

THE TOOL ENGINEER

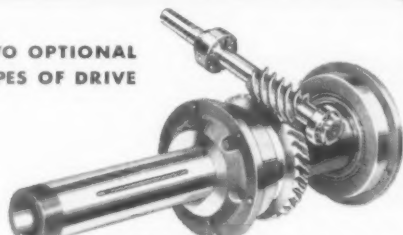
# BIG ADVANTAGE

OF THE OSTER No. 601 "RAPIDUCTION" LATHE



## RELEASES MORE COSTLY MACHINES FOR OTHER WORK

TWO OPTIONAL  
TYPES OF DRIVE



WORM DRIVE for smooth flow of power required for making heavy forming cuts with absence of chatter and...

DIRECT DRIVE for high speed work on small diameter and non-ferrous metals. Spindle speeds up to 3000 R. P. M. are practical.



On small diameter work not exceeding 1½" (round bar) 1½" (square bar) or 1½" (hex bar), the Oster No. 601 "RAPIDUCTION" Lathe is used on a wide variety of bar and chucking operations with efficiencies comparable to more complicated, higher priced machines.

In numerous instances, manufacturers have purchased batteries of the Oster No. 601 "RAPIDUCTION" Lathe chiefly to release their automatics for other work demanding that type of equipment.

Furthermore, the manually controlled, six position turret and the SIMPLIFIED construction and use of the No. 601 "RAPIDUCTION" Lathe speeds up training of new operators, thereby releasing more highly skilled operators for other work.

Complete details describing all the advantages of the No. 601 machine are quickly available. The form below offers you a quick, easy way to ask for this information.

**OSTER**

**Let's GO!**

THE OSTER MFG. CO. • 2063 East 61st St., Cleveland, Ohio

Rush, by return mail ..... copies of Catalog No. 27-A which contains full description and detailed illustrations of No. 601 Turret Lathe.

NAME .....

ADDRESS .....

CITY..... STATE.....

# Roll them off the Line with **APEX**



• Apex Power Bits and Hand Drivers speed war production wherever screws are used. They are made to fit practically all makes of electric, air and spiral drivers—from finest shock-resisting tool steel, heat treated and tempered for maximum wear resistance, toughness and strength.

• Apex Power Bits are long lived, but they do wear out eventually. When they do wear out, do not scrap them—return for RECONDITIONING at a very substantial saving over the cost of new bits.

• There are three Apex booklets—valuable guides to Power Bits and Drivers—each Bit illustrated—details given as to part number, dimensions and power tool it fits. You will want these booklets because of their helpfulness to you. *Write for them today!*

THE APEX MACHINE & TOOL COMPANY • DAYTON, OHIO



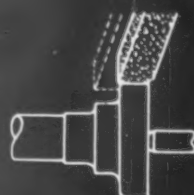
To Finish The Job Quicker . . .



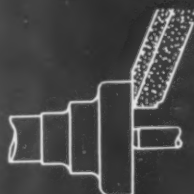
TYPE-C  
HYDRAULIC  
UNIVERSAL  
MACHINE A



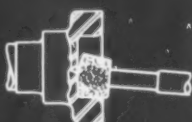
TYPE-C  
HYDRAULIC  
UNIVERSAL  
MACHINE A



TYPE-C  
HYDRAULIC  
UNIVERSAL  
MACHINE B



TYPE-C  
HYDRAULIC  
UNIVERSAL  
MACHINE B



TYPE-C  
HYDRAULIC  
UNIVERSAL  
MACHINE B



TYPE-C  
HYDRAULIC  
UNIVERSAL  
MACHINE B

## MAKE YOUR GRINDERS DO "DOUBLE DUTY" LIKE THESE

Suppose you wanted to grind shafts such as the one shown above. Suppose that in grinding this shaft "speed in production," and "close concentricity between the ground surfaces" were two important requirements.

One manufacturer was faced with this problem. He installed two Landis Type C Hydraulic Universals. Using only these two machines all of the above illustrated operations are performed. On machine A, a diameter, a radius and an adjoining face are external ground with one wheel, while another diameter, a radius and an adjoining shoulder are external ground on the same machine with a different wheel. Machine B is used to external grind the inside radius, the O.D. and the face of a flange with the same wheel. In addition the same machine is used to grind the inside diameter, the inside radius and face, and the radius

at the entrance of the counterbore in the flange. Two grinding wheels are used.

Thus both important requirements are fulfilled. Because the Universal wheel base can be swiveled with ease and because it requires but little time to change over from an external to an internal set-up. and vice versa, rapid production is obtained. Since only two machines are used, the surfaces are held closely concentric.

If you are confronted with a problem involving rapid production, call in a Landis representative. Surely, from among the many types and sizes of grinding machines offered by Landis, the correct machine for your job can be found.

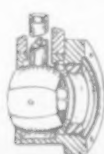
Unusual Performance  
As Usual



394

LANDIS TOOL CO.

WAYNESBORO,  
PENNSYLVANIA



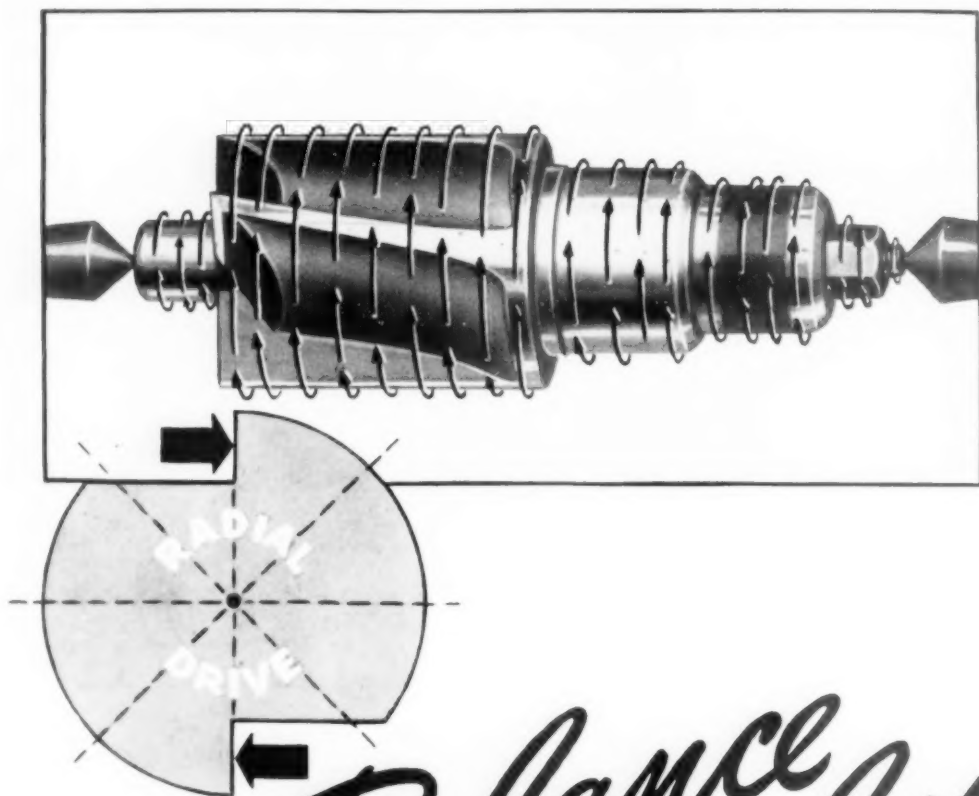
MICROSPHERE  
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COMPACT  
MULTI-SPEED  
HEADSTOCK



MULTI-SPEED  
HYDRAULIC  
TABLE  
TRAVERSE



# *Balance plus*

## PERFECT DISTRIBUTION OF METAL AVOIDS VIBRATION

- Pass a line in any direction through the center of this Radial Drive section—the weight of one side counter-balances that of the other side.
- Spin the cutter on centers—there is no unbalanced distribution of mass to develop eccentric action.
- This balance plus the extra strength afforded by Radial-on-center-drive means cleaner cuts—more cuts— heavier load possibilities.

**ECLIPSE COUNTERBORE COMPANY**  
DETROIT • MICHIGAN

# "That's why we call 'em 'Victory' lathes!"

Dear Frank,

Madison, Wisconsin

Remember how busy we thought we were last summer, before you left? Honestly, that was just a breeze compared with the way things are going now!

Guess we told you about those big turret lathes we're going to build in such large quantities. With a few modifications -- with a new production set-up -- and with the Green light from Uncle Sam, we're going to turn them out 1500% faster than we've ever built these sizes! That'll put 'em where they're needed in a hurry! That's why we call 'em "Victory" lathes!

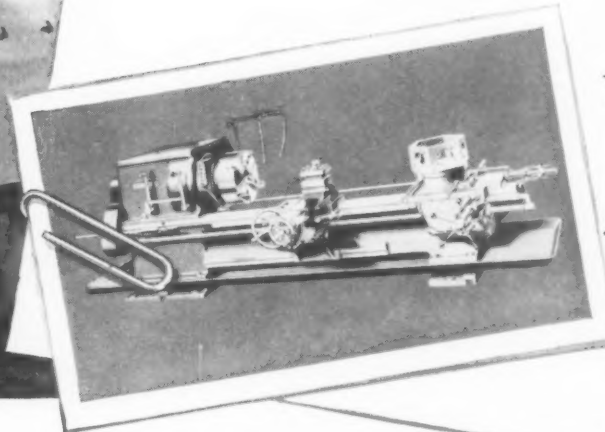
So you see, we're rolling, too, Frank! And we're going to keep it up just as fast and as long as we have to until the Axis hollers "Nuff!"

That's the way we feel about it. So do the fellows who will operate these lathes. It's our fight as well as yours. So, if it's a war of machines they want, let's give it to them! They asked for it!

Keep 'em rolling, and we'll do the same!

Best regards,

The fellows at Gisholt



Here's how the new "Victory" models look. They're modified versions of the standard Gisholt Saddle Type Turret Lathes with 21" and 24" chucks 5 1/4" and 9 1/4" spindle bores



Here's news as welcome on the production front as it is on the fighting front. Learn what Gisholt is doing to help solve a pressing problem for America's vital war industries today.





# *Change Over* is a matter of minutes on **model LR Lo-swing LATHES**

War production plants appreciate the speed and simplicity with which Lo-swing Automatic Lathes can be changed-over from job to job. Take Model LR for example: A hinged door provides easy access to the Simplified Change-Over Mechanism located on carriage front. Simply loosen two cap screws and move gear segment to graduation on scale corresponding to desired length of cut in inches. Tighten cap screws and carriage is timed for the job at hand. Cam is standard and does not have to be changed, and since the cycle is closed and locked, machine cannot get out of time.

Rapid traverse adjustment is accomplished with equal ease and speed thru the hinged door at the head end of machine. Loosen two cap screws and slide the ring which is graduated in inches around until the length of cut desired in inches is opposite the zero mark. This automatically positions the rapid traverse control cams so that the remainder of the cycle is completed in rapid traverse. A Rapid Traverse Control Handle, conveniently located just below the door opening further facilitates this adjustment and reduces change-over time.

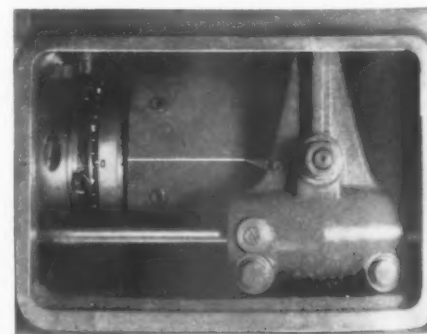
These and other Lo-swing features, developed in the peace-time past, are now proving their value under the stress of war production.

## *Seneca Falls*

**MACHINE COMPANY**  
SENECA FALLS, NEW YORK

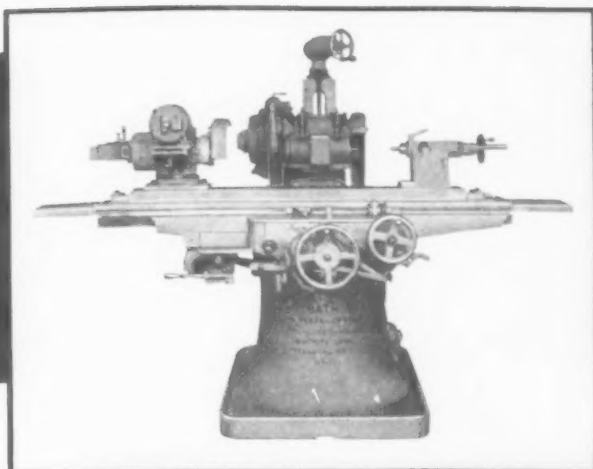


Close-up view of Simplified Change-over Mechanism.



Close-up view of drum cam showing index line and graduated adjustment ring.

**BUILDERS OF Lo-swing LATHES**



*A Complete*  
**GRINDING DEPARTMENT  
 FOR TOOL ROOM AND  
 SMALL LOT WORK...**

Conserve time, floor space and money on small lot grinding jobs—Investigate the Fitchburg Bath Universal Grinder.

This one grinding machine will often fill every grinding requirement of an entire tool room or small shop—it will handle external, internal, surface, tool, spur gear cutter and other classes of grinding. A minimum of down-time is required to change from job to job.

*It is a whole grinding shop in itself.*

Send for large, profusely illustrated folder  
 —free to executives requesting it on their  
 business letterhead.



**FITCHBURG GRINDING MACHINE CORP.**  
**FITCHBURG, MASSACHUSETTS, U. S. A.**

*Manufacturers of—Bowgag Wheelhead Units, Multiple Precision Grinding Units, Spline Grinders, Cylindrical Grinders, Gear Grinders, Bath Full Universal Grinders and Special Purpose Grinders.*



# You'll Agree



## WITH THOUSANDS OF OTHER *High Priority Producers*

● They think the new Model H is the best all around off-hand tool they have ever

tried and we are sure



you will agree with them. It's fast (50,000

R.P.M.), more powerful, has a handier grip. If you are doing priority work, order

the new Model H Kipp Air Grinder today! Please attach



preference

rating



certificate with order and mail to Madison-Kipp

Corporation, 209 Waubesa Street, Madison, Wisconsin, U. S. A.

**THE NEW  
MODEL**

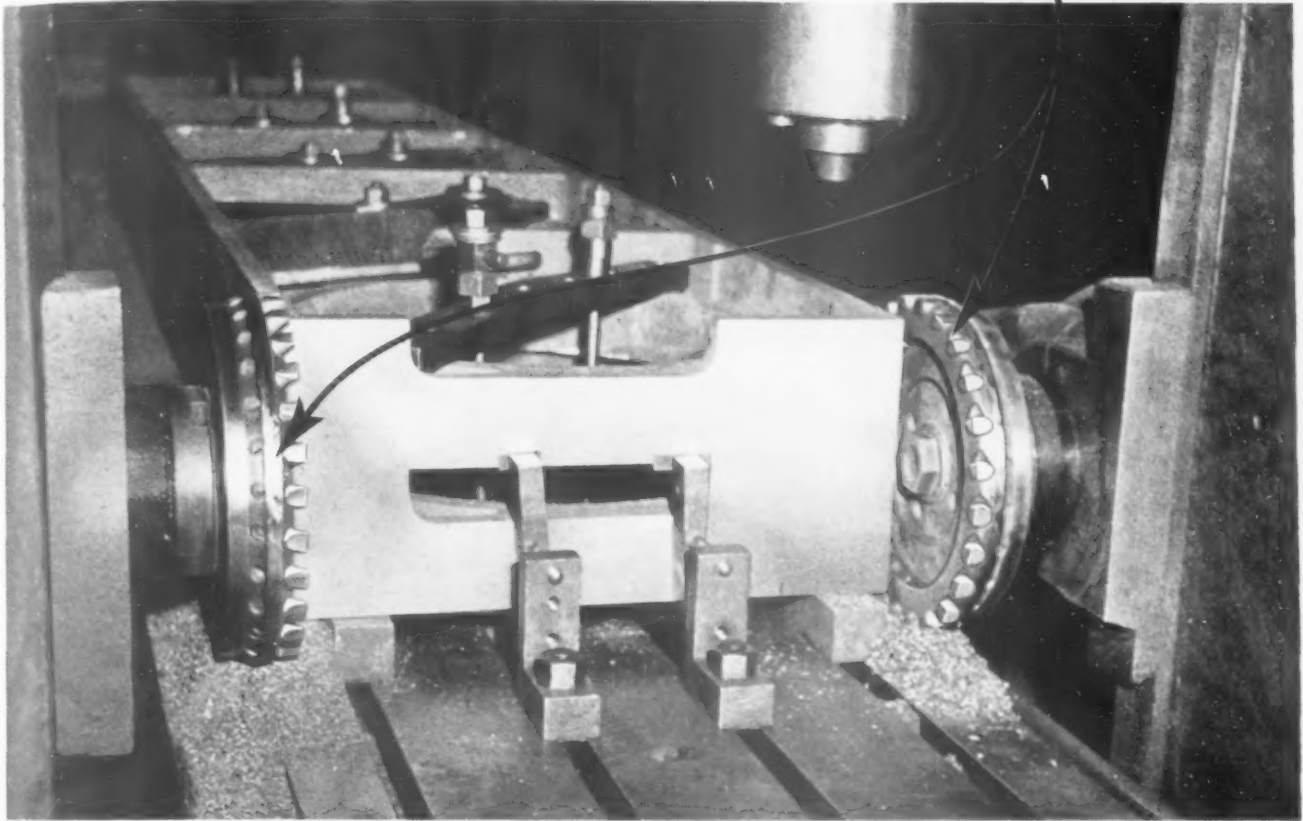
**H**

**KIPP *air* GRINDER**





# THE PRODUCTION STORY IS WRITTEN **HERE**



## It makes better reading when Lovejoy Milling Cutters are used

Lovejoy Milling Cutters will help the production of any milling machines — this is *important* at any time, but *vital* now that so many old (or even obsolete) machines must be kept in service.

Design and construction make the big difference. Lovejoy Mills have alloy steel housings — heat treated and precision ground. Blades are positive locking, and

interchangeable over a wide range of sizes. More than one-half the blade can be used. Lovejoy Mills can take it — at high speeds and coarse feeds, yet they consume a minimum amount of power.

Old machines will do better — new machines will do their best — with Lovejoy Milling Cutters.

# LOVEJOY

## TOOL COMPANY Inc.

### Springfield, Vermont, U.S.A.



Please send me your latest 24 page catalog covering the complete line of Lovejoy Milling Cutters.

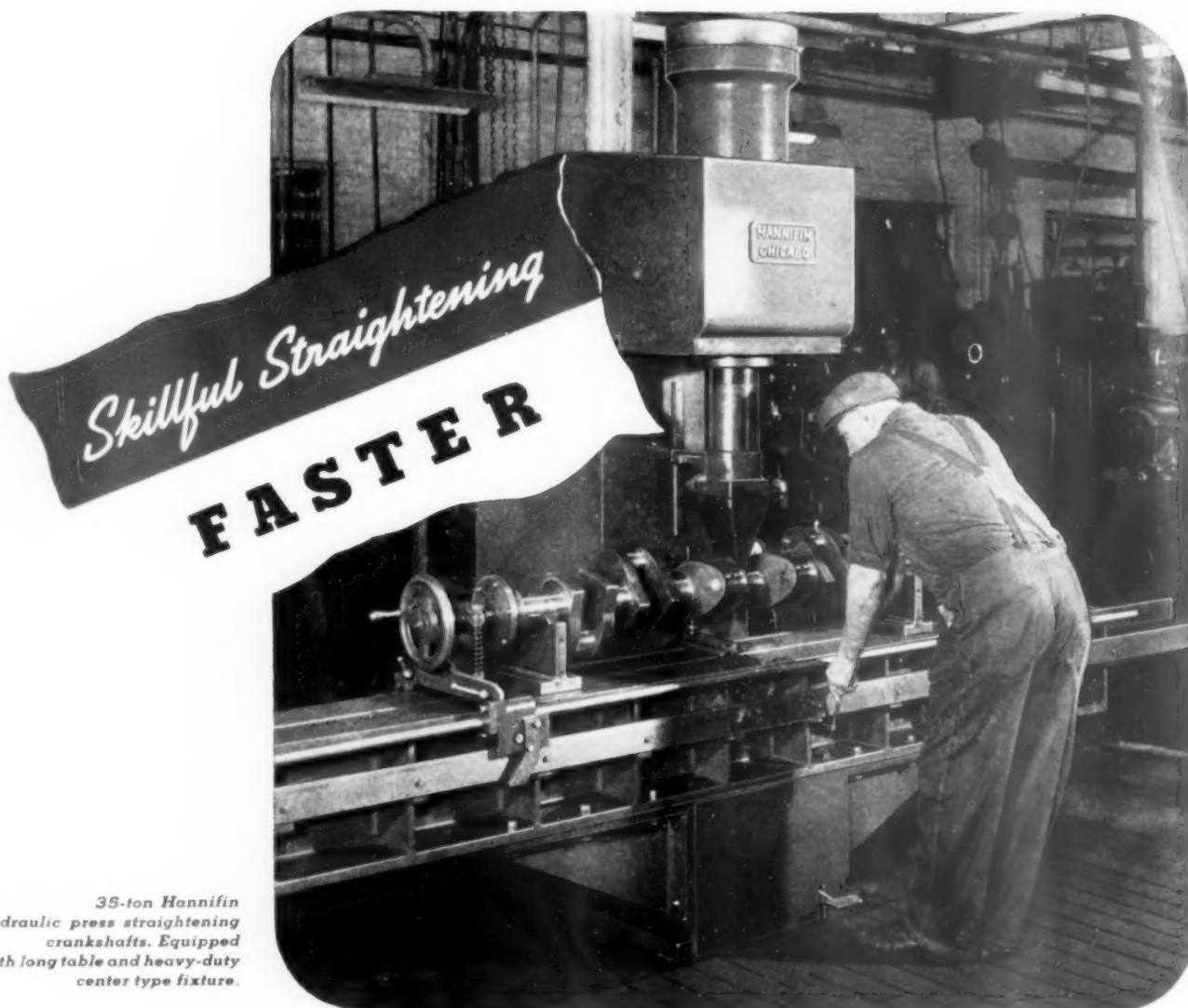
NAME \_\_\_\_\_

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CITY \_\_\_\_\_ STATE \_\_\_\_\_

M



35-ton Hannifin hydraulic press straightening crankshafts. Equipped with long table and heavy-duty center type fixture.

**A**CCURATE straightening of heavy crankshafts is a job that takes a delicate touch, with some of the touches measured in tons. Rapid production that can be maintained consistently requires simple handling of the work, and simple control of the press, so that the operator's skill can be devoted to the straightening operations.

This Hannifin hydraulic press meets these modern requirements for fast, accurate production. The operator has any ram pressure needed, at a touch of the fingers, from a few pounds to the full capacity of 35 tons. The exclusive Hannifin sensitive pressure control provides complete control of ram pressures, infinitely variable in proportion to the amount

of control lever movement.

Fast, accurate, easy handling is the natural result of this simple Hannifin pressure control. Its performance contributes to increased production in hundreds of plants building machine tools, aircraft, armament, trucks, and other essential equipment.

Hannifin standard presses offer many advanced features of design and construction, and

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**HANNIFIN**  
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## *Pay Dirt*

Because of the shortage of trained men, Tool Engineers are working around the clock to produce needed quantities of weapons. But human endurance will not allow this to go on forever.

An officers training school is needed for the production front. Young men must be made into efficient, responsible aides to Tool Engineers, quickly.



What's being done about this problem?

One answer has been supplied by the American Society of Tool Engineers which has initiated a training program. Another solution is offered in this magazine, where both advertisers and editors are presenting down-to-earth lessons in Tool Engineering. A turret lathe manufacturer is devoting space to an "Ideas for Victory" program, disseminating "know-how" just as do such editorial features as "Applied Tool Engineering" or "The Crib."

A steel company is telling through example what Tool Engineering is, just as does a well-known author in this issue. A grinding equipment manufacturer is publishing lessons in grinding as fundamental as this magazine's series on welding.

But base metal cannot be transmuted into gold. Nor can the classroom or magazine automatically select talent for encouragement. It is the responsibility of the Tool Engineer on the production front to distinguish pay dirt from "salted" ore.

### *Converting Experience*

Important as the job that must be done for youth, is that which experienced Tool Engineers have done for themselves. Many have newly educated themselves on the use of tools, metals and precise dimensions with which they have had little experience. True, Tool Engineering implies versatility and adaptability. Such characteristics are taken for granted. But, let's not take them for granted for the moment. Let's realize that the return to fundamentals is usually a tougher job than the initial one of learning.

In this light, the Tool Engineer's successful conversion of a plant to new jobs is all the more noteworthy. It means he has had to convert himself first of all. He has changed pace, possibly shifted life-time objectives in mid-stride to instruct himself in new tools, new materials and new methods.



# What is Your G.I.Q.?

(GAGE INTELLIGENCE QUOTIENT)



Standard "Not Go" Ring Gage



Standard "Go" Plug Gage

**You** can buy and use gages to better advantage if you can answer *all* these questions correctly. How about it?

Correct answers are printed below—upside down.

- 1 Is a gage a measuring device? . . . . .
- 2 Define "Limits". . . . .
- 3 What is "Tolerance"? . . . . .
- 4 What is "Allowance"? . . . . .
- 5 There are two general classes of gages, Working and Inspection Gages. When is each class used?
- 6 Which holds the product to the closer limits? . . . . .

## ANSWERS

- 1 Not actually: "Go" and "Not Go" Gages compare the size of the product with its predetermined maximum and minimum limits.
- 2 Limits are the maximum and minimum dimensions of a part.
- 3 Tolerance is the permissible variation between the maximum and minimum limits of the product.
- 4 Allowance is the amount of intentional difference between mating parts. Positive allowance provides clearance, negative allowance provides interference.
- 5 Working Gages are used by the operator working on the product and Inspection Gages are used by the Inspector who passes the product.
- 6 Working Gages.

*This is one of a series of advertisements published by Greenfield Tap & Die Corporation to help users get greater production from their small tools in these critical times, through making useful facts more widely known*

Write us for extra copies of this page, or for additional information.

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THE TOOL ENGINEER

**A War Production Board  
Consultant Explains the  
Effect of Priorities and War  
Demands on the Availability  
of Tool and Die Steels**

**S. C. Spalding**

**W.P.B. Consultant in Charge,  
Tool and Die Steels**

COMPARED to the changes necessitated in other fields, changes in the tool steel set-up have been minor in character. They are nonetheless, important. Probably, the best way to illustrate what changes have been made because of the present emergency is by comparing a list of standard steels of several years ago with what is at present available. Such a list is given in Table I.

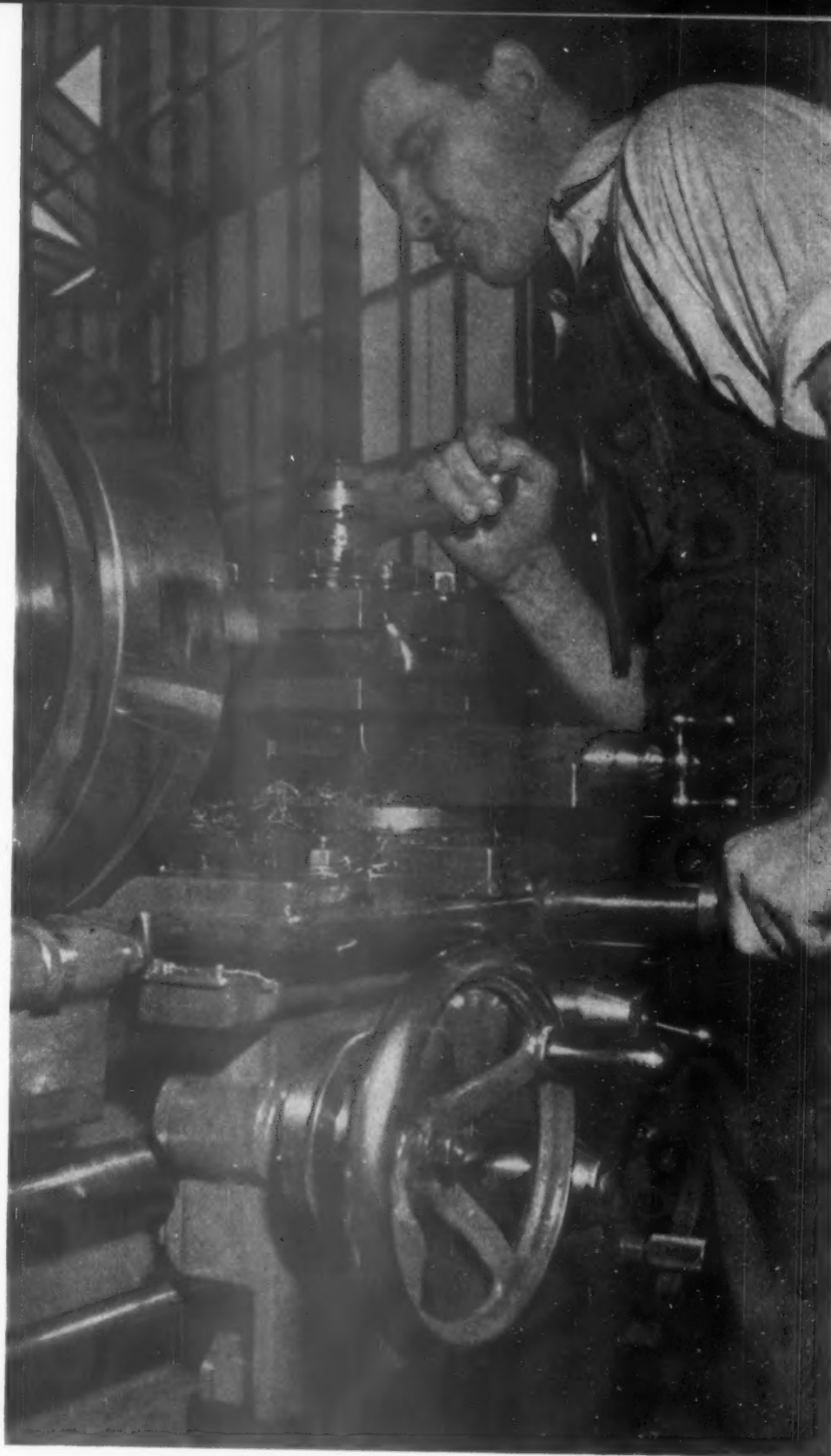
Cross out Number 2 in Group A, cross out the vanadium in all grades in the other three groups with the exception of 6, 7, and 8 of Group D and the present setup is shown. Since this chart was made up, in addition to the moly steel shown as Number 8 of Group D two others have been added. Number 8, as shown, is what is known as the Momax type. To this has been added a 5 to 6 tungsten, 4 to 5 moly steel known as the D.B.L. type, and a tungsten free, 8 to 9 moly known as the Van lom or VM type.

**Moly High Speed Steels**

Also, in all the high speed types, the vanadium has been cut to a maximum of one per cent in the tungsten grades, the 18-4-2 and 14-4-2 grades having been eliminated. The cobalt grades have been cut to a maximum of 1.9 vanadium. The three moly grades have had their vanadium cut to one percent for Momax, 1.5 for D.B.L. and 1.75 for the Van lom or VM.

There is some small amount of so-called super moly steels made, which consists of any of the moly grades to which four to eight percent cobalt is added, and vanadium stepped up as high as 1.9. The use of these steels has not as yet been very wide-spread.

The moly high speed steels were coming along fast anyway, and the war, with the tungsten shortage devel-

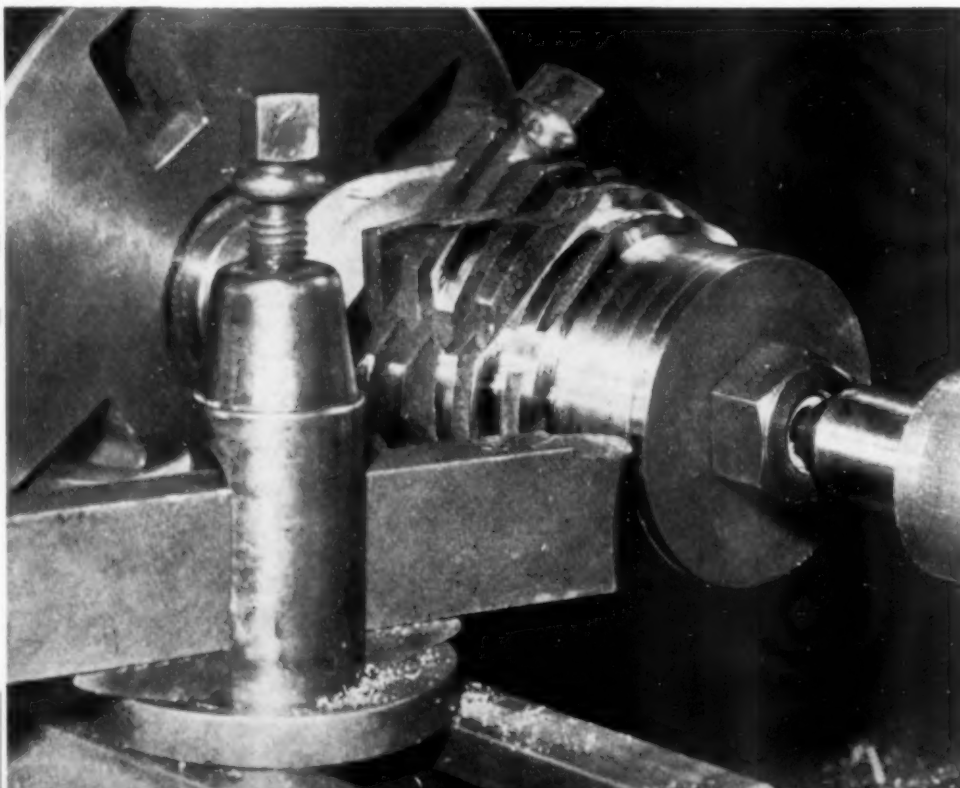


**Steel Substitutes For**

**Tools, Jigs and Fixtures**

TABLE I

Type	C	SI	MN	ANALYSIS CR	NI	V	W	MO	CO
<b>GROUP A—Carbon Tool Steels</b>									
1 Carbon Tool .....	.70-1.30	.25	.25						
2 Carbon Vanadium .....	.70-1.30	.25	.25			.20			
3 Carbon Chrome .....	.80-1.10			.50					
<b>GROUP B—Oil Hard, Tool Room Steel</b>									
1 Carbon Manganese .....	.80-1.00		1.00-1.50	May Cont. .50		May Cont. .20	May Cont. .50		
<b>GROUP C—Low Alloy Tool Steels</b>									
1 High Carbon Tungsten .....	1.30-1.40			.50			3.50-5.00		
2 Med. Carbon Tungsten .....	1.00-1.20			.50		.25	1.50		
3 Chrome Tungsten .....	.45- .60			1.25-1.75		.20- .30	2.00-2.50		
4 Chrome Vanadium .....	.45- .60			.80-1.20		.15- .25			
5 Chrome Nickel .....	.70- .85			.75-1.00	1.75-2.00	May Cont.		May Cont.	
6 Carbon Chrome .....	.80-1.10			1.25-1.75 May Cont.		.25		.20- .40	
7 Silicon Molybdenum ...	.40- .60	1.00-2.00	.70- .90	1.80-2.00				.40- .80	
<b>GROUP D—High Alloy Tool Steels</b>									
1 High Carbon High Chrome .....	1.50-2.20			11.0-14.0		.40		.60-1.00	
2 Chrome Hot Work .....	.80-1.00			3.00-4.00					
3 Tungsten Hot Work .....	.25- .50			2.50-4.00		.50	8.00-18.0		
4 Chrome Tungsten Hot Work .....	.30- .40			4.00-7.00			4.00-7.00		
5 Chr. Molybdenum Hot Work .....	.30- .40			4.00-5.00				1.25-2.00	
6 Tungsten High Speed ...	.65- .75			3.00-4.50		.75-2.25	14.0-20.0		
7 Cobalt High Speed ....	.65- .75			3.00-4.50		.75-2.25	14.0-20.0		5.00-12.0
8 Molybdenum High Speed	.70- .85			3.00-4.50		.80-1.50	1.50	8.00-9.50	

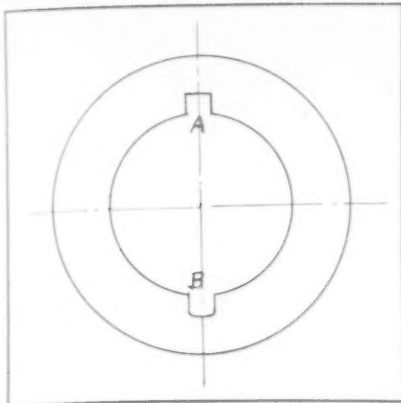


oping, pushed them very rapidly to the fore. The first order issued from Washington limited all users to 50 percent of the tungsten steels to 50 percent of the moly steels. This was later amended to require the use of 75 percent moly steels, or better known as type A, to 25 percent tungsten steels, or better known as type B.

The fact that this ratio is being maintained, indicates that the fears that originally existed as to the ability to heat treat and use these steels were greatly exaggerated. To help in this, a committee was formed by the then O.P.M. to draw up information and instructions on the selection and handling of these steels. This information was pretty well disseminated through the country about a year ago. Of the three types mentioned, the

**THE TOOL ENGINEER**





Design does more to insure long tool life than juggling of steel and treatment. Stresses tend to build up at abrupt changes of sections as in sharp keyways. Right and wrong methods of making keyways are illustrated here.

D.B.L. comes closest to matching the 18-4-1 in hardening characteristics and, in fact, it is claimed it can be handled in the same equipment and by the same methods as applied to 18-4-1 with the same results.

### Carbon Tool Steel

Carbon steel, sometimes called plain carbon tool steel, or just tool steel, is the tool steel of industry. It is by far the most widely used and most adaptable for a variety of purposes except machine cutting tools, where high speed or carbide is pre-eminent. One reason for this is that with suitable variations of carbon and hardening treatment, it ranges in adaptability from the softer machine steels up to all degrees of hardness. In the higher carbon analyses it hardens file hard with simple water quench, yet, due to the fact that the depth of hardening effect is definitely limited, and the hard surface is backed up by a softer, tougher core, it has a resilience and ability to absorb shocks not possessed by many of the more expensive alloy steels. It can be worked over and re-hardened a number of times without harmful results. The forging and hardening of it are relatively simple, in other words, it couples the best of all around properties with ease of handling. Under war conditions, with the shortage in alloying elements, the place of the carbon steel in the tool room becomes more important than ever.

Another thing which cannot be over-emphasized at this time is the importance of preserving and getting

the best possible life out of tools. This is not all a function of steel and hardening. Design plays a most important part. Actually, more can be done by so designing the tool as to eliminate or minimize weak points to insure long life, than by juggling of steel and treatment.

Too many times tools are designed from a mechanical standpoint only, with no consideration given to the metallurgical aspect of the problem. It is well recognized that when stress

is applied to a body, if the body is symmetrical in section, the applied load tends to distribute itself evenly over the body being stressed. If, however the body is not symmetrical, and contains sharp angles, abrupt changes of sections and keyways, the stresses tend to build up at these localized points to high values. The effect of a notch on a plain cylindrical piece when subjected to tensional stresses is such that the stress in tension is multiplied two or three times its orig-

**TABLE II**  
**Effect of Finish**

Type Finish	Percent of Endurance Limit
Polished	100%
Ground	92
Smooth Turned	83
Rough Turned	80
Depth of Notch	
.004	75
.020	59
.080	58

Note: Taken from tests by Faulhaber

### Effect of Radius of Fillets

Radius Fillet	Percent of Endurance Limit
15.75	100%
.59	85
.24	63
.12	48
.04	33
0	25

Note: Data by Lehn & Marlander

### Effect of Keyways on Endurance Limit

Specimens were made up one inch in diameter with keyways one-eighth inch deep and one-quarter inch wide—one with sled runner type ends and the other with regular rounded ends.

Type Ends	Percent of Endurance Limit
Sled Runner Ends	62%
Rounded Ends	48

Note: Taken from data by Petersen

### Effect of Transverse Holes on Endurance Limit

Size Hole	Size Specimen	Percent of Endurance Limit
0	Any	100%
1/4	1"	71
3/16	3	53

Note: Taken from data by Petersen

**TABLE III**  
**Available Steels**

SAE or AISI Number	C	Mn	Ni	Cr	Mo
A4027	.25-.30	.70-.90	.....	.....	.20-.30
A4037	.35-.40	.75-1.00	.....	.....	.20-.30
A4063	.60-.67	.75-1.00	.....	.....	.20-.30
A4068	.64-.72	.75-1.00	.....	.....	.20-.30
NE8024	.22-.28	1.00-1.30	.....	.....	.10-.20
NE8124	.22-.28	1.30-1.60	.....	.....	.25-.35
NE8233	.30-.36	1.30-1.60	.....	.....	.10-.20
NE8245	.42-.49	1.30-1.60	.....	.....	.10-.20
NE8339	.35-.42	1.30-1.60	.....	.....	.20-.30
NE8442	.38-.45	1.30-1.60	.....	.....	.30-.40
NE8447	.43-.50	1.30-1.60	.....	.....	.30-.40
NE8547	.43-.50	1.30-1.60	.....	.....	.40-.60
NE8620	.18-.23	.70-.95	.40-.60	.40-.60	.15-.25
NE8630	.27-.33	.70-.95	.40-.60	.40-.60	.15-.25
NE8724	.22-.28	.70-.95	.40-.60	.40-.60	.20-.30
NE8739	.35-.42	.75-1.00	.40-.60	.40-.60	.20-.30
NE8744	.40-.47	.75-1.00	.40-.60	.40-.60	.20-.30
NE8749	.45-.52	.75-1.00	.40-.60	.40-.60	.20-.30
NE8817	.15-.20	.70-.95	.40-.60	.40-.60	.30-.40
NE8949	.45-.52	1.00-1.30	.40-.60	.40-.60	.30-.40

All of the above steels contain .20-.35 silicon and .040 maximum each sulphur and phosphorus.

In addition to the above the usual plain carbon (1000 series), high sulphur (1100 series), high phosphorus (1200 series), Silica manganese (9200 series) steels are available in the various carbon ranges, as are, also, certain other carbon molybdenum (4000 series) steels.

inal value at the base of the notch. Bear in mind that this is simple static tension, not impact and all the other dynamic stresses which a tool experiences in service (Table II shows effect of design factors on endurance limits.)

#### Effects of Threads

The effects of threads are illustrated by the findings of Stanton and Barstow, who showed that screw threads on a specimen subjected to repeated stress reduced the endurance limit to 67 percent of what it should be, reckoned on the area at the bottom of the thread.

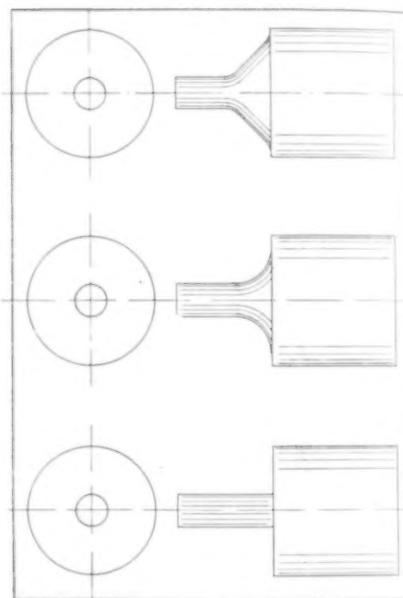
All of the above figures are on medium carbon alloy steels and would be much accentuated in the case of hardened tool steels.

As, of necessity, many tools must contain some or all of these deleterious features. Design allowing generous fillets, radii, and chamfers will do much to mitigate their effect. Best of all, of course, is to design tools so as

to eliminate these weak points. It is self-delusion to believe that because a tool in use is not subject to shocks and impact stress, that these precautions can be avoided. Most tools have to be hardened and in the hardening operation of itself, they are subjected to greater stress and shock, in many cases, than they may ever be in use. More tools and parts are broken in use and in the hardening operation through the neglect of the designer or mechanic, in omitting proper fillets or radii at sharp corners, than because of any other single cause.

Another important point is to avoid attaching small sections to large ones unless it can be done by gradual tapers or radii. In hardening of a piece, heavy stresses are set up which are localized at the point of attachment of the small section and if the change of section there is abrupt, it will probably fly off. If the designer will only visualize the hardening operation when he is designing a tool, the failure in hardening will surely decrease.

Usually the last operation on a set of tools before delivery to the shop for use is grinding. Many a perfectly designed and hardened tool has been spoiled in grinding. In the first place, the proper wheel speeds and feeds should be selected by experience and consultation with the grinding experts of the grinding wheel companies. Improper grinding can both soften and crack hardened tools. With improper grinding conditions any hardened tool can be cracked and ruined. Tools overheated in hardening are more susceptible to cracking than those properly hardened and proper drawing or tempering lessens the susceptibility to cracking.



**It is important to avoid attaching small sections to large ones unless it can be done by gradual tapers or radii. Failure in hardening will decrease if tool designers will remember this.**

Just as with tools, carbon steel as described, with its versatility of properties, will fill the bill for a large number of jig and fixture jobs.

#### N. E. Steels

Where alloy steels become necessary instead of the customary well-known S.A.E. Steels, the National Emergency, or N. E. Steels must fill present requirements. These steels have been worked up with the thought of replacing in most instances the common and familiar alloy steels and with them the Tool Engineer may do any required job in the jig and fixture line which cannot be handled with plain carbon steel.

These recommended steels, together with existing SAE equivalents, are described in the new Iron and Steel In-

stitute Manual No. 5, entitled "Possible Alternates for Nickel, Chromium and Chromium-Nickel Constructional Alloy Steels." The conservation of alloying elements in the National Emergency Steel Specifications is based chiefly upon the principle that small quantities of several different elements are more effective than larger quantities of any single element found in such combinations.

It is certain that these National Emergency Steels and certain others containing none, or less strategic elements, will soon be the only steels available. It is therefore imperative that industry take the necessary steps to change over as quickly as possible

so as to be prepared when the supply of habitually used steels is cut off.

### Strategic Elements Scarce

Steels containing the strategic elements nickel, chromium, tungsten, cobalt and vanadium may only be used on extremely important functional parts. Hence industry is urged to use carbon and intermediate manganese steels (1000-1100-1200 series); carbon molybdenum (4000 series); manganese molybdenum (8000-8100-8200-8300-8400-8500 series), or silico manganese (9200 series), wherever possible.

The analyses of the alternate steels

which will be available are given in Table III. Existing steel specifications with the National Emergency equivalents are given in Table IV.

Those interested in obtaining these steels can apply to their regular steel sources. Heats have already been made by a number of companies.

In the early stages of this program it may not be possible for a user to obtain the exact bar size or shape to which he is accustomed and it may be necessary to accept some other size and possibly even a forged bar in order to carry out a test program.

Test steel should be ordered in the usual manner and complete information included on the PD-1 form.

**TABLE IV**  
**Steel Specifications**

STANDARD SERIES DESIGNATION				POSSIBLE ALTERNATES SAE or AISI Number		
1942 AISI Number	1941 AISI Number	Number 1942 SAE	1941 SAE Number	Number	Number	Number
A1320	A1321	1320	1330	A4027	NE8024	
A1330	A1330	1330	1340	A4037	NE8233	
A1340	A1340	1340	2315	A4047	NE8245	
A2317	A2317	2317	2330	A4027	NE8024	NE8620
A2330	A2330	2330	2340	A4037	NE8233	NE8630
A2335	A2335	2335	2345	A4063	NE8339	NE8739
A2340	A2340	2340	2345	A4068	NE8442	NE8744
A2345		2345	2515	A4068	NE8447	NE8749
WD2350			3120	A4068	NE8547	NE8949
A2515	A2514	2515	3130	A4027	NE8817	
A3045	A3045		3135	A4068	NE8442	NE8744
A3120	A3120	3120	3140	A4027	NE8024	NE8620
A3130	A3130	3130	X3140	A4037	NE8233	NE8630
A3135	A3135	3135	3145	A4063	NE8339	NE8739
A3140	A3140	3140	3150	A4068	NE8442	NE8744
A3141	A3141	3141	3240	A4068	NE8447	NE8749
A3145	A3145	3145		A4068	NE8447	NE8749
A3150	A3150	3150		A4068	NE8547	NE8949
A3240	A3240	3240		A4068	NE8442	NE8744
WD3250				A4068	NE8547	NE8949
A4119	A4119	4119	X4130	A4027	NE8024	
A4130	A4130	4130		A4037	NE8233	NE8630
A4137	A4137	4137		A4063	NE8339	NE8739
A4142	A4142			A4063	NE8442	NE8744
A4145		4145		A4068	NE8447	NE8749
A4150		4150		A4068	NE8547	NE8949
A4320	A4320	4320	4320		NE8124	NE8724
A4340		4340	X4340	A4068	NE8547	NE8949
A4620	A4620	4620	4620	A4027	NE8024	NE8620
A4640		4640	4640	A4063	NE8339	NE8739
A4645				A4068	NE8447	NE8744
4650				A4068	NE8547	NE8949
A4820	A4821	4820	4820		NE8124	NE8724
A5045	A5045			A4063	NE8339	
A5120	A5120	5120	5120	A4027	NE8024	
A5130	A5130			A4037	NE8233	
A5140		5140	5140	A4063	NE8339	
A5145	A5145			A4068	NE8442	
A5150	A5152	5150	5150	A4068	NE8447	
A6120	A6120			A4027	NE8024	NE8620
		6130		A4037	NE8233	NE8630
WD6140				A4063	NE8339	NE8739
A6145				A4068	NE8442	NE8744
A6150		6150	6150	A4068	NE8447	NE8749



# Applied Tool Engineering

## Clamped-On Tool Tips

**Want to eliminate serious tool tip breakage?  
Here is one solution to the problem—a clamp-on tip—which made it possible for one plant to operate for months without serious breakage.**

**S**HOPS making up their own carbide cutting tools can greatly simplify the job and at the same time be assured of strain-free tools, by using a clamped-on tool.

The simple but satisfactory design shown in the accompanying sketch was made by the McKenna Metals Company, producers of Kennametal. A tool shank is milled out, care being taken to get as flat a surface under the tip as possible, and a simple clamp attached. The SAE 1045 clamp is not used to break the chips as it would soon be eroded to destruction. Instead, a conventional chip breaker of angular shelf type is ground into the tip.

Any danger of brazing strains is of course eliminated entirely, and grinding is greatly simplified since only the tip is in contact with the grinding wheel, no steel to load

up and glaze the special silicon carbide grit. One such SAE 1045 shank will serve to mount about four successive tips before it becomes cut and battered badly, and a harder steel would probably last even longer.

As the tip is reground, it is moved forward and out under the clamp, shims being placed behind it. When the tip becomes too small for service in this tool, it can frequently be brazed into a smaller shank for lighter turning operations or boring.

The freedom from strains due to unequal expansion of tip and shank makes a great difference in tool life, particularly on "home made" tools which are frequently made under widely varying conditions. These tips make it possible to operate for months without breakage.



## Boost for Negative Rake

The article on negative rake in the July, 1942, TOOL ENGINEER, feature on Applied Tool Engineering was interesting since it deviates from the conventional in solving many current cutting problems, especially on interrupted cuts. What the writer of the articles failed to point out is that rake

tools have this advantage: that there is no direct load on the point of the tool. The tool breaks the chip at the heel—i.e., at the extreme o.d. of the bar or work being turned where the strength and resistance to shock is greatest. The point merely determines the desired diameter, and does very

little work. Hence, cratering is reduced, tool life is lengthened, and speed is increased. A number of engineers who read this article in the new "Crib" department in last month's magazine described it as especially timely in view of unusual war production cutting problems.

UP TO THE MINUTE  
SHOP PRACTICE

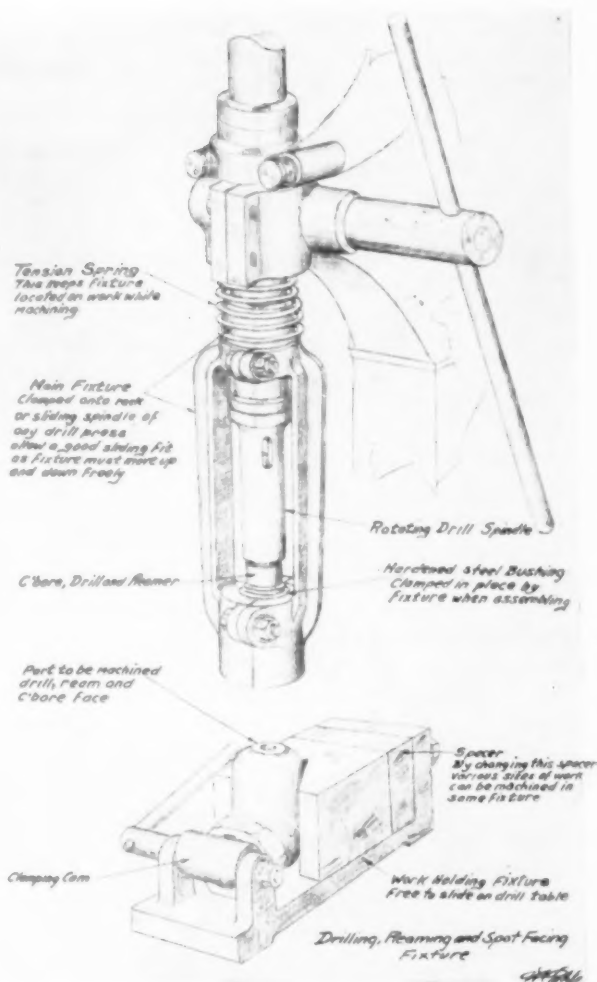
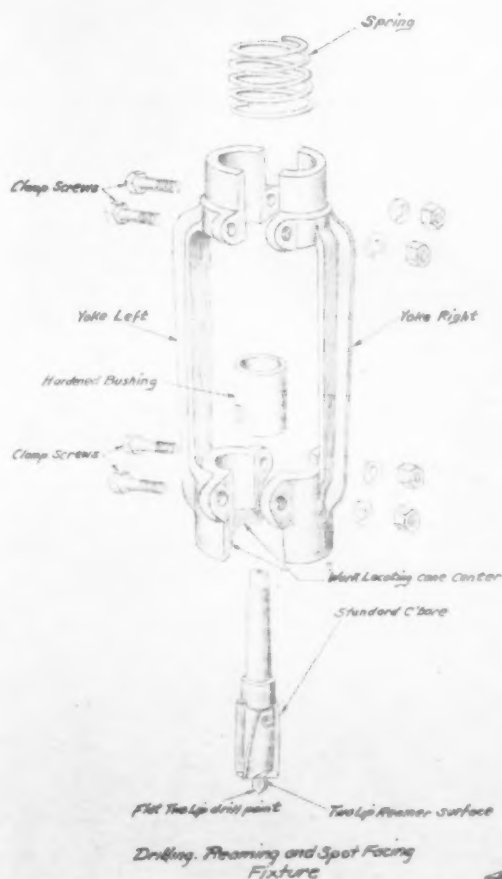
With more jobs than tools available to do them, Engineers might well study every idle machine and gadget for possible conversion to a task waiting for equipment especially designed to handle it.

## Drilling, Reaming and Spot Facing Tool

Walter B. Pohle, Supt., Spray Engineering Co.

IN trying to keep up with the ever increasing production demand with present equipment, it is a constant nightmare and headache to find the machines available for extra work. However, in almost every manufacturing plant, there is still a machine or gadget lying idle, which, with a little planning, can be put to useful work. In a number of instances, this revised, revamped idle machine may turn out work faster than the machine first planned for the operation.

Oftentimes a turret lathe having five or six stations will be set up for one or two drilling operations. In re-planning, it may be found that the drilling operations are the



longest. Why tie up a valuable machine just to drill a hole when anywhere from twelve to fourteen drill spindles may be idle in the plant? Further, inexperienced help can operate these drill spindles if they are set-up with a fixture designed to handle the work.

Called upon to increase production 100% and unable to buy the necessary new machines on quick delivery, one company has designed fixtures to split operations, so that every spindle in its plant is doing its share of work.

The attached two drawings show in detail how one job was licked and the work taken from a turret lathe and performed in a drill press, utilizing inexperienced help. This not only freed the turret for more important work but also increased production on the part by 500%.

# Tooling for Arc Welding

**A. E. RYLANDER**  
Industrial Engineer

**M**ANUAL arc welding graduates into the semi-automatic stage when applied in combination with power operated positioners and correlated fixtures. Having arrived at this intermediate stage, it is only necessary to include automatic welding heads, to put the job definitely in the automatic class. In this article we will describe commercial positioners as well as special fixtures designed to put arc welding on a mass production basis. For, just as the machine tool must have its jigs, fixtures and cutters to function, so welding must have its tools, both simple and automatic, if parts and assemblies are to be produced *en masse*.

So far, there is an analogy, in that both methods of metal processing must employ tools for the efficient processing of metal. The difference is in that where the machine tool removes stock, the welder puts it on, with the anomaly that it also cuts, as in oxy-acetylene or flame cutting. Essentially, however, welding implies

the joining of two or more parts to make a fabricated assembly.

Structural shapes, such as channels, can be welded to make box sections, or angles can be welded to channels and beams to make simple machine or fixture bases. On the other hand, plates and pressed steel shapes can be combined to produce assemblies limited only by the imagination and ingenuity of Product and Tool Engineers. As a consequence, we are fabricating gun carriages, tanks and ships that, on the whole, are proportionately lighter and stronger than their prototypes of World War No. 1, made from machined castings or riveted plates. Of course, welding does not obsolete the machine tool, which is in greater demand than ever, nor does it threaten the foundries, now operating to capacity. It does not supersede riveting as a method of metal joining, as witness airplane fabrication. Rather, it supplements other processing, augments the output of tool room and production shop and, drawing on steel mills and press shops for rolled and drawn shapes, relieves pressure on the foundries.

An interesting comparison can be drawn between the machine tool

which (as differentiated from the special machine) can reproduce itself, and the welding positioner shown in Figure 1, employed to fabricate its own kind on a larger scale. Outside of the uniqueness of reproduction, the illustration has other points of interest. The operator is working from a portable, vertically adjustable staging or elevator, with the transformer mounted directly on the base, the whole comprising a self contained unit of considerable flexibility. The positioner, in turn, is raised from the floor; in combination with the elevator there is provided wide latitude without resort to pits which, though often necessary, nevertheless constitute industrial hazards.

Of course, positioners can be raised and lowered by hydraulic jacks, superficially similar to the mounting column shown, but even a jack would entail some auxiliary staging for intermediate heights. See Figure 2, showing a positioner used for welding a bearing assembly. Here, the operator stands on a wooden platform, in this case necessary and efficient enough if not as "mechanical" as the planned provision of the adjustable elevator.

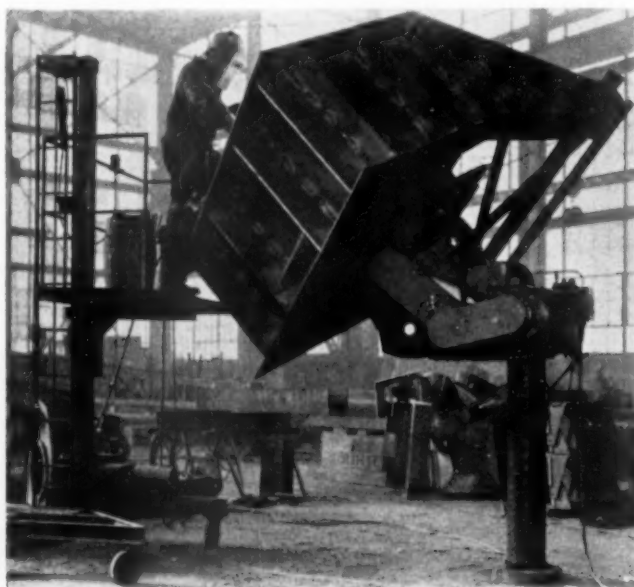


Figure 1. Cullen-Friestedt semi-special welding positioner that can reproduce itself.

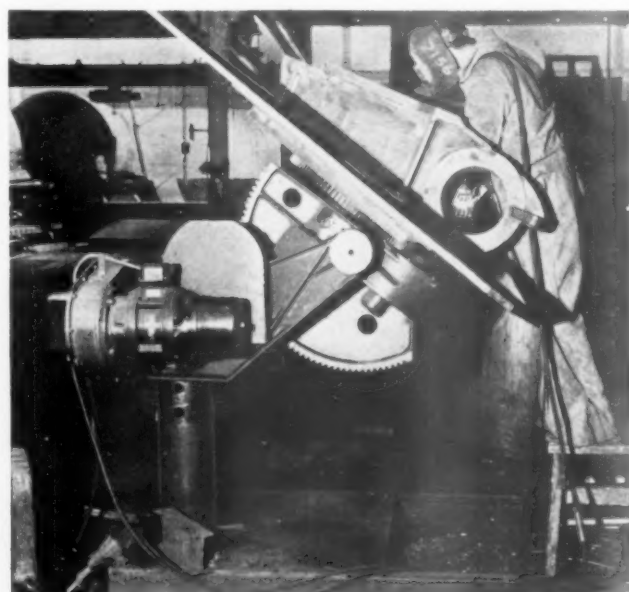


Figure 2. Another Cullen-Friestedt positioner used for welding a bearing assembly.



Figure 3 shows a positioner used for welding a complicated assembly demanding more than ordinary flexibility of handling for its fabrication.

Together with Figure 2, the illustration shows the mechanism of the positioner in considerable detail. As can be seen from the gearing, the table is

fully rotatable and, motor driven, ideally designed for continuous, circular welding. It is also tiltable (by motor drive) from horizontal or flat to negative 45° — a total range of 135°. Control can be local or remote.

#### Rotable Tables

The positioners shown in Figures 1, 2 and 3 are manufactured by the Cullen-Friestedt Company, and range from smaller units up to 18,000 lbs. capacity in standard sizes. Similar positioners, differing only in detail of design and gearing, are made by the Ransome Concrete Machinery Co., and as far as commercial units are concerned, the Tool or Welding Engineer is limited in choice between the two. Both have tables fully rotatable for continuous, circular welding, with comparable tilt, both are ruggedly designed and as nearly universal as human ingenuity can devise. Certainly they can be termed revolutionary contributions to the art of arc welding and are unique in that, while fixtures in themselves, their usefulness is enhanced by auxiliary fixtures or holding devices.

Of somewhat limited application, by comparison, but handy nevertheless, is the Lyon Hydraulic Elevating Welding Table, made by the LYON-Raymond Corporation, and shown in Figure 4. While not a "positioner" in the sense implied, the table is manually rotatable and easily raised or lowered to convenient welding height. The unit provides an economical medium for the simpler welding operations a base for special fixtures.

Various hydraulic lifts used for servicing automobiles are also adaptable to position welding, and may be used in combination with either of the two universal positioners described above, or as elevating stages for operators.

Two interesting welding applications are shown in Figures 5 and 6. Here, Ransome positioners are employed to position intriguing "objects". Each is an excellent example of welded assembly. Figure 5 is especially interesting in that the table is tilted to an approximate 45° negative angle, with the work overhanging the base by a considerable margin — ample proof that the positioner can "take it". Figure 5 also shows the essential difference between the two makes, the Cullen-Friestedt (Figure 3) employ-

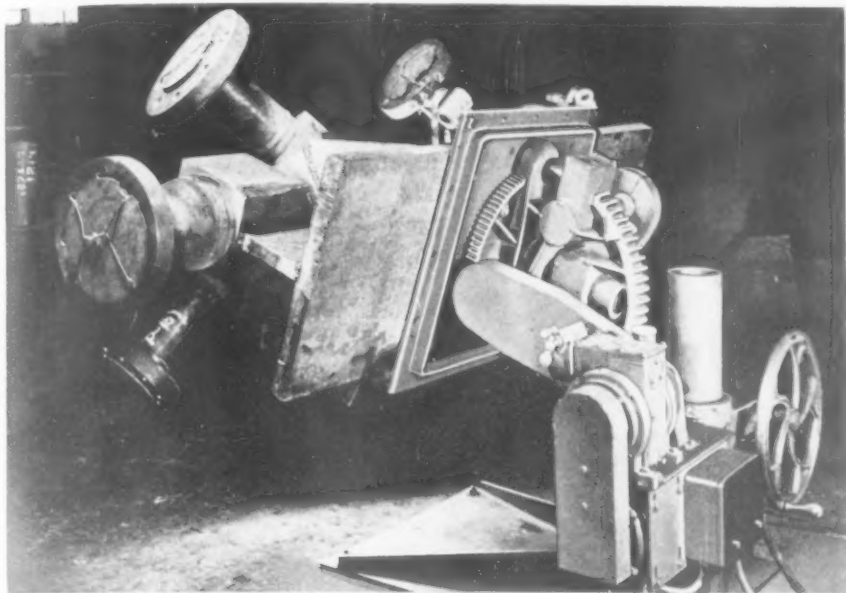


Figure 3, above, is an awkward assembly handled on a Cullen-Friestedt positioner.

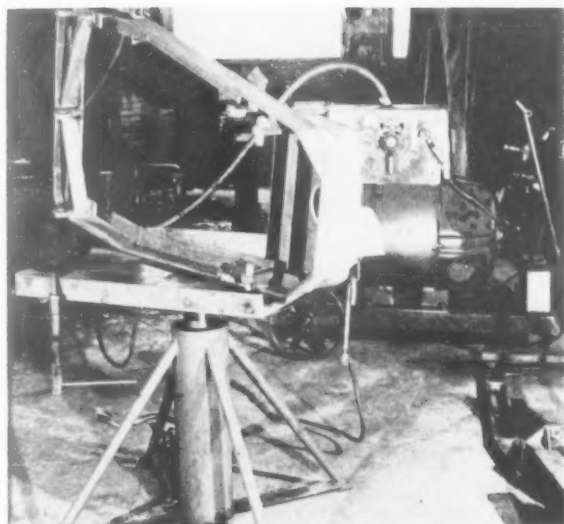


Figure 4, left, is a Lyon Hydraulic Elevating Welding Table. It is handy for simpler welding operations.

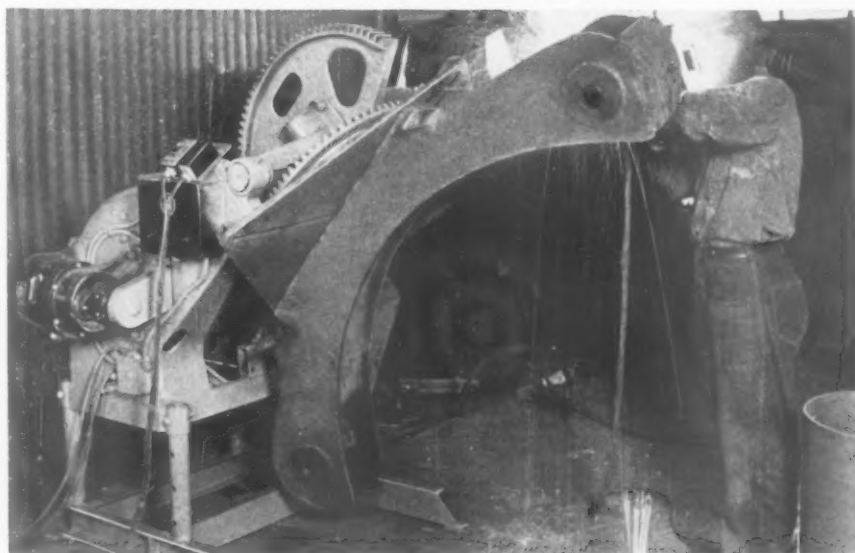


Figure 5, below, is proof that welding positioners can take it. This is a Ransome design.

ing spur drive to rotate the table, whereas the Ransome incorporates bevel gears. Both units are commendably designed and unreservedly recommended.

A very interesting method of positioning (also a Ransome application) is shown in Figure 7, where the unit comprises a head and tailstock, with the work held between the two. Only the headstock is rotatable, tilt not being necessary, and motor driven, with the tailstock serving merely to take the strain of extreme overhang. Obviously, auxiliary holding fixtures would be required in actual use. The illustration serves merely to illustrate an idea. A similar application (in this case a Cullen-Friestedt job) is shown in Figure 8; here, however, a standard positioner is used in combination with an outboard pedestal bearing. Either application is provocative in its implications; in combination with "tailstocks", a standard positioner can be loaded beyond its capacity.

### Automatic Welding

While on the subject of commercial positioners, an application of automatic welding, in which a standard positioner is employed in combination with a welding head, may not be amiss. In the July TOOL ENGINEER — Welding Techniques — the first illustration showed a Cullen-Friestedt positioner used to weld end flanges to a skeleton drum. The weld was manually applied, but the use of the positioner made the operation semi-automatic; i. e., the positioner table rotated under power while the bead was manually laid. Now, by use of a welding head, the operation becomes automatic, the operator having only to tend to equipment.

The term automatic being relative, one can steer a middle course or go to extremes. For example, it would seem sufficient that, once loaded, the positioner makes as many revolutions as is necessary to build up the required bead, with intervening chipping or cleaning, after which the drum can be reversed to weld the opposite flange. Both ends completed, the head must then be receded to permit unloading and loading of the work, and so on, cycle for cycle. Or, one can incorporate a cleaner—say a rotary wire brush or even a sandblast—with the revolution of the positioner table electrically controlled and re-

cession and advance of head automatically controlled as well. One could go further yet and incorporate auto-

matic loaders and discharge conveyors. As has been implied, there is no limit to Tool Engineering ingenuity.



Figure 6. Another Ransome positioner used to position an intriguing object.

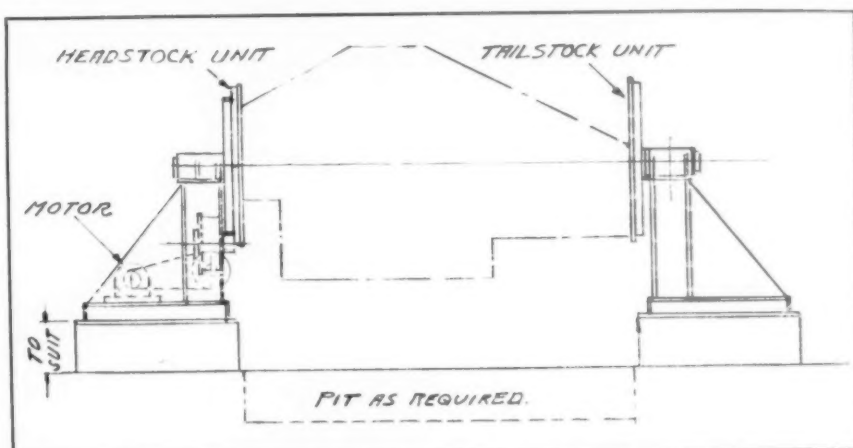


Figure 7. A Ransome application is this unit with a head and tail stock.



Figure 8. Cullen-Friestedt job in combination with outboard pedestal bearing.

The controlling factor would be: does it pay?

While commercial positioners have broad applications, there are cases where special designs have advantages. For instance, an assembly may require many hours to weld if the job is to be completed in one setting, and it may not be expedient to hold it that long at one station. In many cases it may be more economical to break a job into sub-operations, or even to weld on movable conveyors. Take, for example, the nondescript assembly shown in Figure 9, the job being frankly "invented" for this explanation but the idea applicable to anything that may look like it. The bottom and side plates, figuratively speaking, have been pre-welded by the *Unionmelt* method, (May 1942, *TOOL ENGINEER*) and we are now to weld in the bulkheads, all fillet welded to bottom and side plates.

#### Job Analyzed

Assuming the assembly to be eight by two feet in cross section and 18 feet long, and that each weld will require six passes, cleaned between each pass, and assuming further that we weld at three inches per minute, which is slow enough but permits of easy figuring. We then have two transverse fillet welds of approximately 96 inches each (three operators working simultaneously, so that we only have the time for one bulkhead to consider) which, being on opposite sides of the bulkhead, entails two positions to weld. That is, the assembly must first be tilted 45° one way, then 45° opposite tilt to weld the opposite fillet. Now, 96 inches divided by three inches per minute implies 32 minutes per bead or three and one fourth hours to apply six beads, plus one half hour for chipping—a total of three and three-quarter hours per fillet. We now reverse tilt and weld the opposite side, making a total of seven and one-half hours which, together with positioning and the operators taking an occasional rest, means that we have consumed an eight hour shift for the bottom welds.

We now have the sides which, being but two feet high, will require one fourth of the time of the bottom welds, or say four hours per unit for both sides—a total of 12 hours. Let us now assume further that the desired production is 24 units per day,

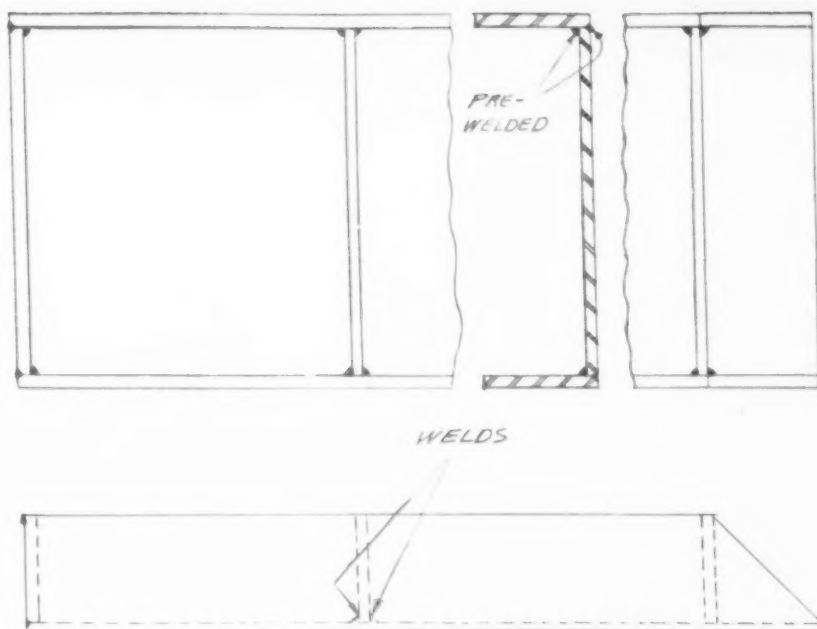


Figure 9.

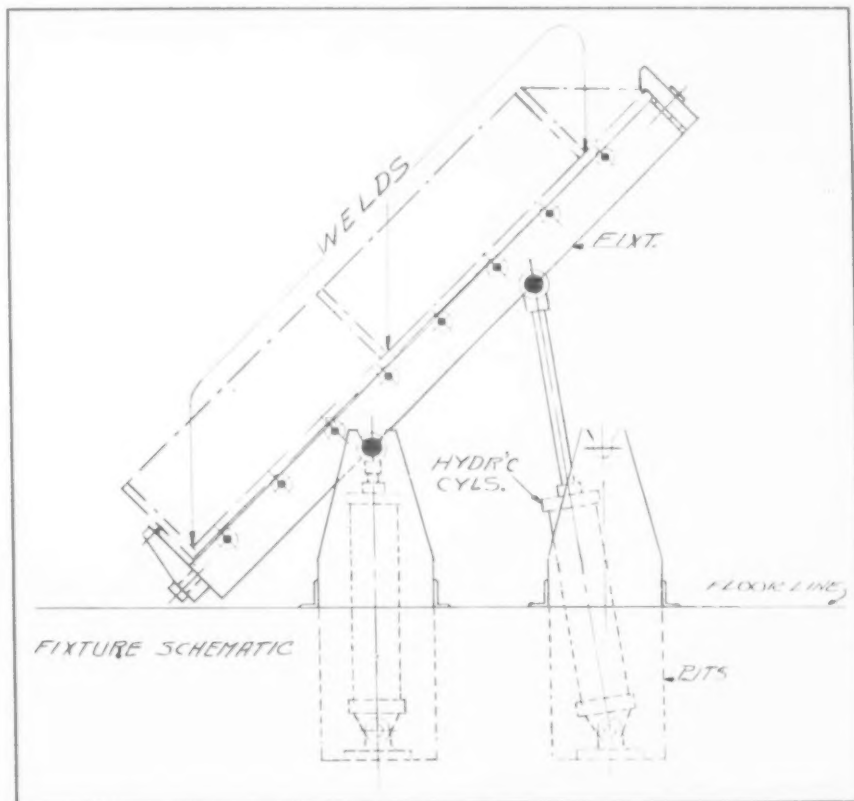


Figure 10. Simple positioner used in welding bottom fillets in Figure 9.

running three shifts. If it requires 12 hours per assembly, we may assume two per day per positioner, or a total of 12 positioners required. Not a very big item; say an investment of about \$45,000 for commercial positioners plus cost of fixtures—\$60,000 in round figures. This is a mere bagatelle in a war where we pinch pennies but spent a million dollars casually.

However, there are other considera-

tions—space, for example. To swing the units would require a minimum 10 feet radius, with five feet extra for safety, or a total circle of 30 feet per positioner. Under best disposition that would require about 8,500 square feet of floor space, to which would be added the hazard of "leapfrogging" if the positioners are to be serviced by overhead cranes. Of course, more efficient handling could be worked out



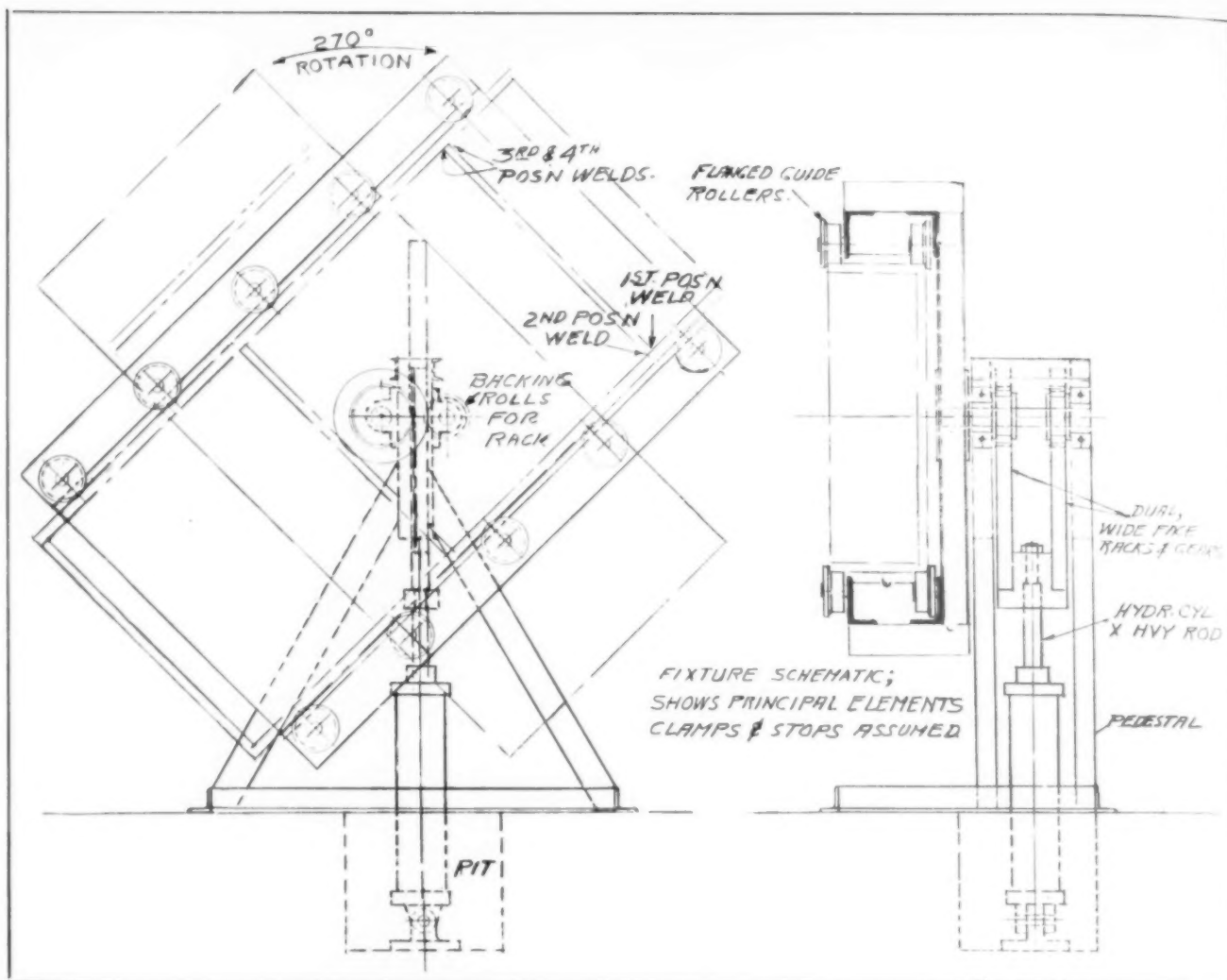


Figure 11. Positioner used to weld side fillets in job shown in Figure 9.

with more floor space, or, the positioners could be loaded by roller conveyors. That, however, would add complications, as the initiated know.

Now then, let's break the job up, welding the bottom fillets in the simple fixture shown in Figure 10. The time element is the same, consequently nothing saved there. But, we do the one weld only, requiring eight hours which, working three shifts, means that only eight fixtures are needed. They will cost about \$3,000 each, or \$24,000 for eight. Furthermore, the fixture is the same approximate overall dimensions as the assembly, to which—so that there be no unfair comparison—we add 5 feet all around for safety. Say, 500 square feet per fixture, or 4,000 feet total.

We now transfer the assembly to a second station Figure 11, where we weld the side fillets. Again, the time is comparable—say four hours per unit—but, that means that we only need four fixtures to meet the required 24 per day production. These, too,

will cost \$3,000 each, or \$36,000 for all 12 fixtures, so we've saved something there which we can apply toward efficient handling. Also, we require only 336 square feet per fixture (safety space included) or 1,344 feet for the four. Added to the 4,000 feet for the preceding stations, we have a total of 5,344 square feet, or a saving of over 3,000 square feet of floor space which we may now use to promote efficient handling. But then (again figuratively speaking) we get it for nothing.

#### Cranes Are Eliminated

Refer, now, to Figure 12, a floor layout showing the two fixtures discussed in relation to each other and all serviced by a combination shuttle carriage and tilter, shown in Figure 13. We will estimate its cost at \$7,500, with trackage at \$3,000, which makes the total cost of the alternative \$46,500. Having some money to spare, we'll invest it in an additional two fixtures each as of Figures 10 and

11, by which time we will have used up most of our original \$60,000 investment and an equal amount of floor space. But, we have cut down the time lag considerably, because we can now load two extra fixtures while the rest are working; there is now a minimum of idle time during loading and unloading. The first fixture cleared is unloaded and the part moved to the next open station, while the operator simply leaves the completed job and transfers to the nearest loaded fixture.

In handling, we have eliminated cranes entirely, with their hazardous leapfrogging and resultant wear and tear on the nerves of high strung operators. We have also improved plant layout and provided leeway so that the production schedule can be stepped up on demand—a not unlikely contingency in this man's war. In the alternative method, of course, we have discussed "paper" fixtures and a hypothetical situation, and the thesis may be criticized on that ground.

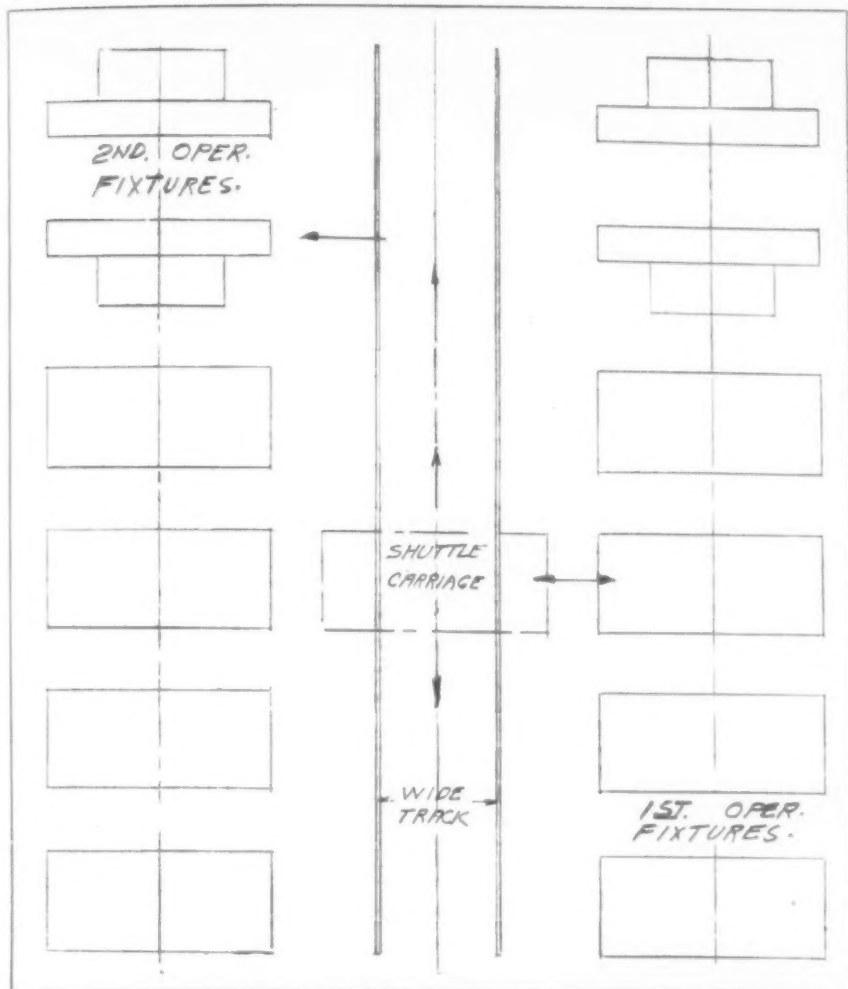
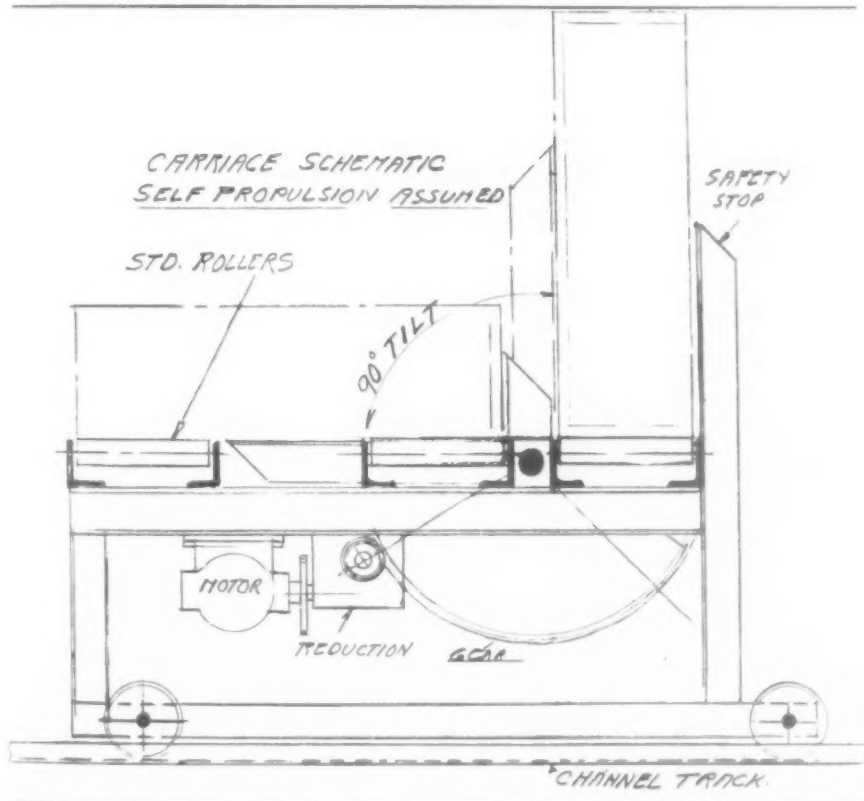


Figure 12, above. Second operation fixtures are those shown in Figure 10. First operation fixtures are those in Figure 11. Shuttle carriage is that in Figure 13. Figure 13, below, is a combination shuttle carriage and tilter.



However, the examples shown in Figures 9 and 10 are entirely practical and very simple, yet designed for fast loading and unloading with a minimum of handling. And, since the winning of this war depends on cooperation, not competition, anyone is welcome to apply the principles incorporated to their own production problems.

In this connection, a brief description may be in order. The fixtures shown are largely similar, and consist of structural shapes joined and braced and provided with suitable clamps. Roller conveyor sections facilitate handling. The trunnions consist of shafts spaced on either side of the center of gravity and solidly secured to the fixture. The shafts bear in open pedestal bearings, with plenty of clearance since precision is not entailed, and also cleared to the radius of the opposite shaft.

#### Safety Feature

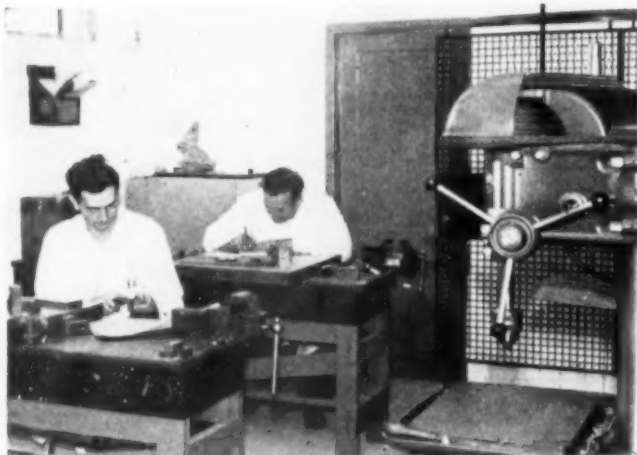
Two hydraulic cylinders, with clevis heads and rods journaled to the cross shafts, are mounted per bank and close to the bearings.

When one bank of cylinders lifts, tilting one way, the opposing bank is at rest, and vice versa, with valves so arranged that only one bank can operate at a time. For additional safety, in the event that pressure should drop, a shut off valve is interposed between the operating valve and the cylinders; the fluid is now "locked" in the cylinders. That's all there is to it.

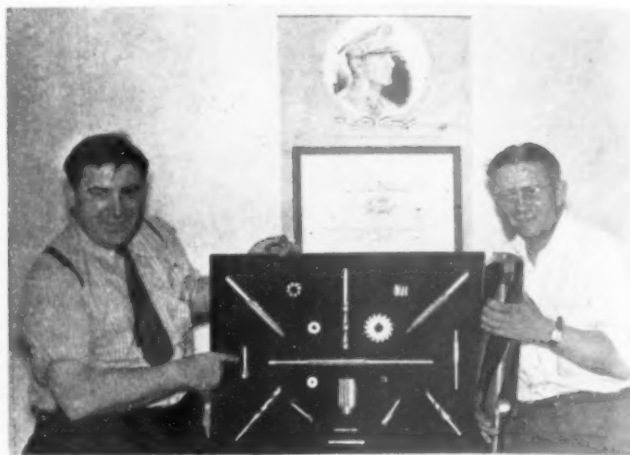
The type of positioner used — as standard or special—depends on various factors; the floor space available and interferences—as building columns—and the nature of the work to be welded, to which and sundry may also be included the tooling allocation. And while the standard, commercial positioners on the market are broadly applicable and imply a sound investment in excellent tools, there are cases where the special design pays a larger dividend on investment. Why, for example, invest from several hundred to as many thousand dollars for a universal machine when a simple fixture, costing much less, will serve the purpose? Inversely, it is poor economy to use inadequate tools. Study the job, then decide the tooling best suited to its production.

This is the third of a series on welding techniques. Another article, dealing with automatic heads, is scheduled to appear in an early issue of The Tool Engineer.

## Big Industry's Stepchildren, Small Tool and Die Shops Are Playing an Important Role on the Industrial Front



Three months ago this shop opened with tools from mail-order house, tool crib grill from closed bank.



Nine months ago they started making small end mill cutters on an old lathe, now make a gun drill at right.

# Small Shop Boom

J. S. Wilford and W. A. Scotten

During the past six months all estimates of the nation's total productive capacity have been surpassed to the extent that America's industrial limits may be determined only by the availability of raw materials.

Contributing much to this phenomenal increase in production has been the mushrooming of hundreds of small tool and die shops in and about the country's larger industrial centers. Born of a job to be done, a prayer and plenty of midnight oil, these little establishments prove the ingenuity, skill and dogged determination to finish the job possessed by American Tool Engineers and mechanics.

Nearly 500 of these vital shops have sprung up within the past 18 months in and around only one war production center.

Started with meager resources—\$35, \$50, \$500—most of them have fought their way up from one man and one machine to several hundred men and as many machines. Industry of the best sort, they were usually started by skilled mechanics who poured sweat, and skill into 24-hour days. At this crucial time they are supplementing the work of the big, established shops where work is piled to the doors. Performing tool and die work in all ranges of quality, sometimes equaling the finest, they deserve



A cup of coffee helps keep a man going who spends ten hours on a grinder.

Below is a heat treat department: A blowtorch and a few fire bricks.



recognition and tools to continue.

For the last six months, they have been engaged in relieving the bottleneck in small tool production. The success of each has resulted more from hard work than genius, from 11 and 12 hour days for workers and from there on up for the owner-workers.

Of the many such shops visited by THE TOOL ENGINEER magazine, four are cited here as typical in their founding, growth and the type of precision work they are turning out.

"I don't care what they ask for. We'll make any kind of cutters they want," said one of the two owner-workers of Shop A. Nine months ago they quit their jobs, one in a rubber plant and the other in a vacuum cleaner factory, and opened shop in a vacant grocery store building with \$85 in cash and one old lathe. Today, 30 men and 27 machines are at work in a new factory building, where an 11 and one half hour shift is turning out 200 step drills.

The first job they took was a small end mill cutter. Now, they specialize in drills and cutters. They polish the margins on drills, but do not polish the flutes. Although they do not look so good, they are clearing the chips.

One of the big jobs being handled by Shop A is a gun drill, with a 17-inch cutting length, and eight-inch



shank and a three and three-quarter-inch O. D. Given an idea of what the tool is supposed to do, and a picture from a catalogue, they went ahead and built it complete with detachable cutting head to save high-speed steel and facilitate grinding.

Three months ago Shop B opened its doors. Today, it is producing 75 to 100 precision gages a day. The business was started with a lathe, shaper, grinder and some small drill presses which were bought through newspaper want ads from a factory executive who had used them in his home hobby shop. Typical of the work done here is a master gage for checking the booster on an aircraft gun. With limits of .0001, these gages check concentricity and location of holes.

A block of approximately 8 cubic inches of machine steel is rough-machined all around to with  $\frac{1}{8}$ -inch. Given a heat treat and carburizing, with quick freeze for seasoning, the rough finished work is jig bored for locating pins, holes being located to within .0001 of sides. A second heat treat and surface grinding all around is made, with internal grinding and lapping on the pin holes to finish the gage body. Pins are heated, ground and lapped before insertion.

An example of the phenomenal growth of this industrial entity is the story of Shop C. Its background is an initial investment of \$3,000 and a lot of intestinal fortitude. In December 1940, two men, one an industrial

school teacher from a large factory, quit their jobs, opened a shop in the garage behind their home. On January 15, they moved to a 50 by 60-foot garage in a nearby alley. The company's plant now covers 36,000 square feet and produces fixtures, jigs, gages, reamers, side-cutters and inserted tooth cutters. When they started, the two men each operated two lathes, taking extra heavy cuts to compensate for slower set-ups.

In new quarters, everything is motor driven. A 25-year-old Keller, salvaged from a fire, was regeared to take today's cutting loads. Used as a Lucas, for profiling and for planer operations, it has proved valuable.

This shop, showing what it could do with a bunch of engine lathes, salvaged drill presses and an old radial drill press has won the respect of its chief customer to the extent that it has been loaned a new radial, and a couple of modern mills. It has grown to sufficient size to sub-contract some of its work.

Paying 15 per cent interest for a \$30,000 short loan, this shop bought out another with a record of 30 years in business. Two days later, all of the equipment from the old shop and its 28 employees were at work in the expanded shop of the war-born concern. The loan was soon paid back. This spring the company opened a tool and die design department. Looking back a few months when they rented drills and cutters for 25 cent a day, the founders of this shop can now boast



**Workers in most small shops are highly skilled. This man grinds by hand to .0002.**

of a sound, going concern with 160 pieces of equipment.

In August 1941, Shop D was opened. Now located in a modern, rebuilt store building, it was started with a lathe, a mill, 2 drill presses, a band saw and a cut-off saw. While the son, still in his early 20's, worked in the shop, his father, was employed days outside managing a big tool and die shop. Nights, they both worked in their own shop.

Now they employ 23 men, turning out \$40,000 worth of cutting tools a month—reamers, counter bores, end mills, and spot facers. In less than two weeks, ten men recently turned out 1,369 reamers of assorted sizes. Only one was rejected. On big tools, they had only a small grinder for finish work, one built to handle 11 or 12-inch tools at the outside. They counterbalanced the table to carry almost twice that size, and finished the O.D. to .0002. Now, they have several big external grinders.

Typical of the precision work performed in these shops and the skilled men who are employed there is a grinder hand in Shop D who, without fixtures except for his hands, grinds a radius to within .0002.

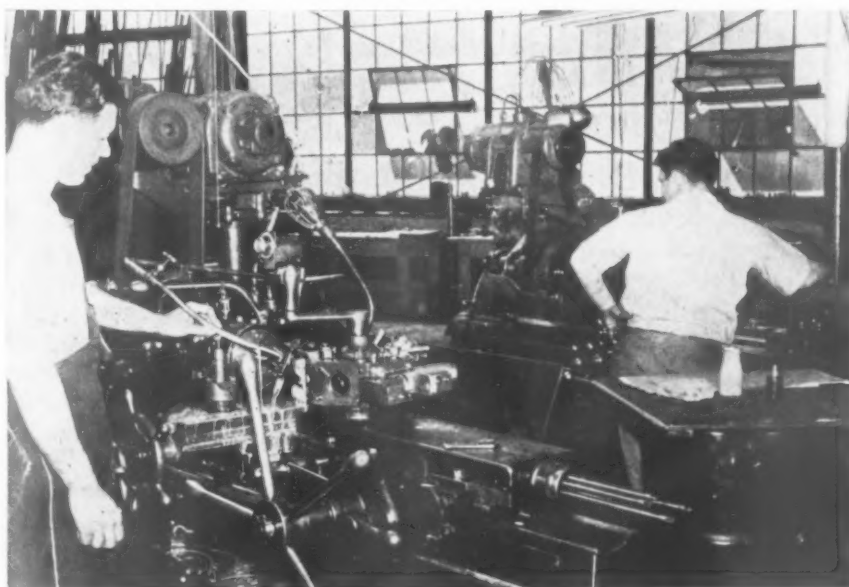
To get started, the father and son pooled their savings for three or four years, bought tools whenever they could meet the price. When they started their own plant, they worked 18 to 24 hours at a stretch.

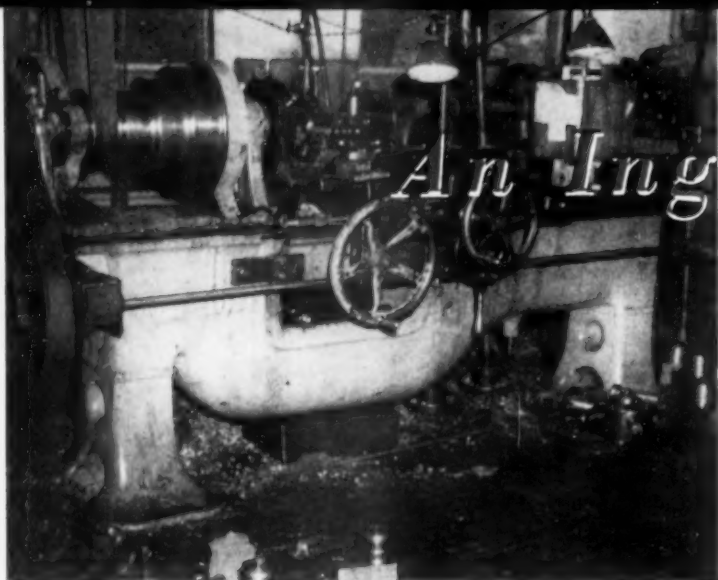
Exemplifying the truly American spirit of such men is the patriotic gesture of these two shop owners. For every five per cent of wages their 23 employees put in War Bonds, the father and son contribute an equal amount to the employees savings.

With such men behind the wheel, America's fight on the industrial front can't be lost.

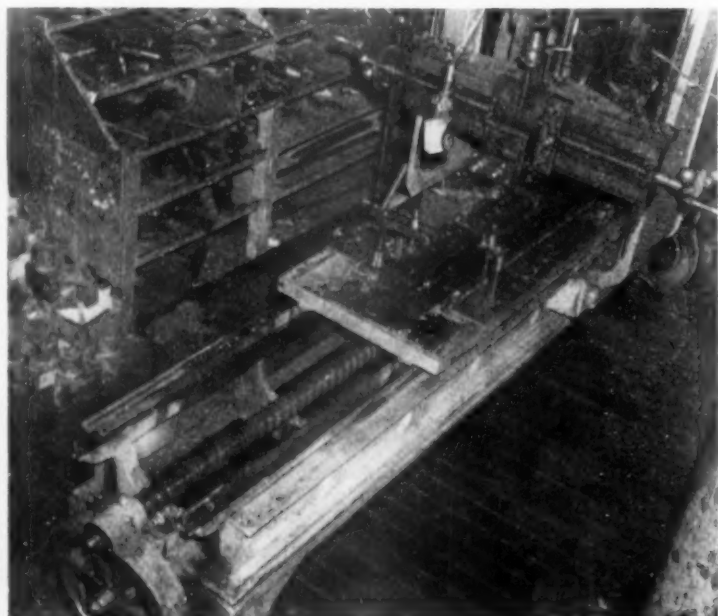
#### PHOTOS BY TOOL ENGINEER MAGAZINE

**The old engine lathe below was converted into a turret lathe in one small shop.**

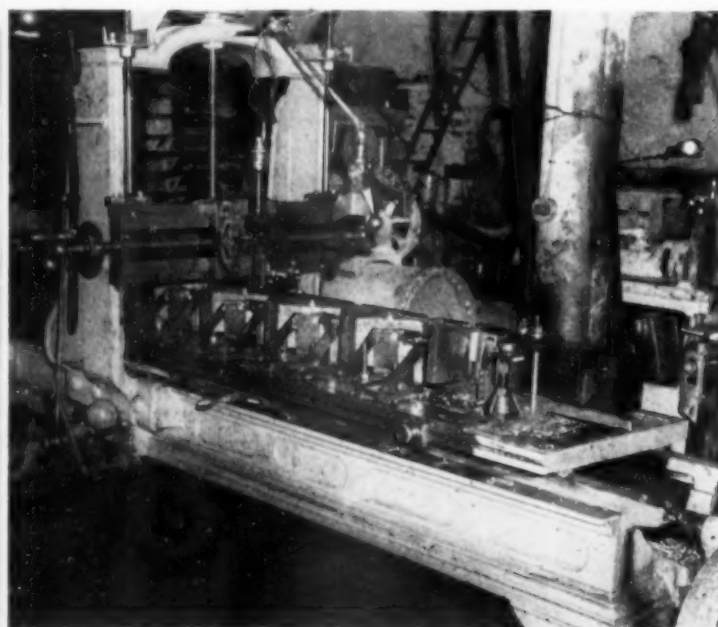




Seventy-five-year-old gap lathe on the job at war production.



This screw-driven planer, 100 years old, was rebuilt.



This ancient machine is now operated 24 hours daily.

# An Ingenious Yankee

Remember Horatio Alger's "Work and Win," "Strive and Succeed"? Here is a story of a Polish-American farm boy in Ware, Massachusetts, whose every action epitomizes that spirit, and the spirit of the town which three years ago won fame in the press as the "Town That Can't Be Licked."

By ADRIAN L. POTTER

ANCIENT and obsolete tools of all descriptions are finding new usefulness through the initiative and imagination of Tool Engineers. A planer built by Gage Warren & Whitney of Nashua, New Hampshire, an estimated hundred years ago and a gap-lathe built about seventy-five years ago by S. W. Putnam and Sons of Fitchburg, Massachusetts, are in production in the shop of John Pilch and his associates in the Ware Machine Works. These machines were left in the buildings of the Otis Company, textile producers for more than a hundred years, when that firm liquidated about five years ago. Ingenuity and necessity, however, paired up to put this practically useless equipment into production. The ways of the gap-lathe were put into good shape and the machine was tightened up all around. The planer head was braced to stand the strain of the work.

With these rebuilt machines, other less-ancient ones were dug out of dark corners and made serviceable.

When production-for-defense started, John Pilch, working in plants near Ware, saw a chance to "do his bit." He invited local boys and young men to make use of these tools. He taught them all he knew and aroused their curiosity to know more. Working together, they built a model shaper, reputed to be accurate to a thousandth of an inch. Then came December and the change from "defense" to "war." John organized the Ware Machine Works, employing only those who had learned machine work under him. Today, the little plant is busy twenty-four hours a day, using forty men to turn out essential war equipment on sub-contract.

THE screw-driven planer is doing a job on fourteen corner-couplings for pontoons at one time. The lathe, intended for use only with flat drills, has been re-built into a turret lathe. It takes care of three operations on the coupling, turning out the work more rapidly than can be done on a three-inch turret lathe of more modern design. There was originally no feed-screw on this gap-lathe, so one has been added, operated directly by belt from an overhead jack shaft. A turret lathe, which the shop acquired, had a feed-screw, but it was too fast. A Model A Ford transmission was mounted overhead and cut in between the shafting and the feed-screw by additional belting, so it has a variety of speeds forward and several reverse.

## Speeding Production:

# Broaching Gun and Rifle Barrels

**FRED SCHYTTE**

*Chief Engineer, Canada  
Illinois Tools, Ltd.*

Since the early tests, the principle of broaching machine gun and rifle barrels has not been varied, although minor changes have been made from time to time in an effort to improve the finish or to increase the tool life. In general, however, rifling by broaching is an established process, definitely out of the experimental stage.

The number of passes required to finish a machine gun or rifle barrel is as follows:

.30 caliber . . . . .	2 passes
.50 caliber . . . . .	2 passes
20 mm. caliber . . . .	3 passes

The broaches are pulled through and produce their own lead. No exterior devices for turning besides a freely rotating puller are required. The ability of the broaches to follow their own lead is created by the sides of the broach teeth and by helical chip breakers in each tooth.

The force diagram (Fig. 1) illustrates this principle. The cutting lubricant is supplied under high pressure. The pressure is built up in a chamber (Fig. 2) which is slipped over the broach after it has been inserted into the barrel.

### Lubricants

Locked into position, the pressure chamber confines the lubricant and forces it over the broach and through the barrel. The construction of the broach facilitates the passage of large amounts of oil. This is done by alternately removing opposing teeth.

Besides acting as a lubricant and coolant, the oil removes the chips from the cutting edges and accumulates them at the back of the preceding tooth.

The first suggestion for the selection of cut per tooth and tooth spacing was taken from the single point cutting tool.

In general, the cut has to be small

enough to cause the chip to roll off in accordion fashion. Heavier cuts would produce more solid chips rolling up in the form of spirals which cannot be accommodated in the long shallow chip space. The chip space is purposely made large to avoid crowding the chips since any resistance to the free flow of the chips would be detrimental to the finish and tool life. Crowding, no matter how slight, will offer that resistance.

Rifling broaches are made of regular high speed steel, hardened to about 65 to 67 Rockwell C. This higher hardness is desirable from the standpoint of tool life, since cutting chips .0002" to .0004" thick in alloy steel of the hardness of gun barrels



"Rifling by broaching is an established process . . . definitely out of the experimental stage"

subjects the cutting edges to considerable abrasion.

Broaches require sharpening after every 75 to 100 passes. Estimated ultimate life for .30 cal., .50 cal. and 20 mm. broaches is approximately 2000 to 2500 barrels.

Production figures are approximately as follows:

.30 caliber barrels of approx. 24" length —	45 barrels per hr.
.50 caliber barrels of approx. 36" length —	30 barrels per hr.
.50 caliber barrels of approx. 45" length —	25 barrels per hr.
20 mm. caliber barrels of approx. 60" length —	15 barrels per hr.

The following is the routine of operations in broaching a barrel:

- (1) Lock barrel in position.
- (2) Insert broach and close puller.

### Broaching Replaces Special Rifling Machines

*In the July, 1942, Tool Engineer, Mr. Schytte discussed general broach design. The portion of his discussion in this issue was not presented then to permit more careful handling by censors.*

In the past all rifling was done on special machines. These machines use a single point tool of correct width and helix angle on a small caliber gun or rifle, and a single or double point tool which fits into a head which slides back and forth through the bore of the barrel on a large gun. The barrel is indexed at the end of each stroke. After a complete indexing the tool is advanced. This cycle continues automatically until full depth has been reached in all grooves. Lubrication is applied to the tool through the rod and head. The lead is imparted to the head by either a sine bar or a helical guide. The time required to finish one 0.30 caliber barrel of approximately 24 in. length is 20 minutes.

The tools used in this process of rifling require a great deal of attention and care. With expert handling, however, this method will produce accurate barrels and excellent finish. Criticism of this process lies in the time expended in finishing a barrel and the necessity for skilled handling of the tool.

It had long seemed logical to apply broaching to the process of rifling small caliber gun barrels, but with the exception of some success on pistol barrels, the net results had turned out to be zero until recently.

In 1938, the Rock Island Arsenal reopened the issue, when it requested broach manufacturers to submit proposals for equipment to broach .30 caliber machine gun barrels. This request marked the beginning of a long series of experiments which resulted in the first successful rifling broach.



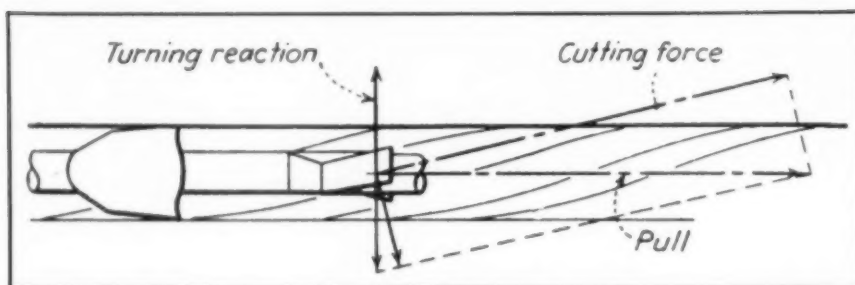


Figure 1. The ability of broaches to follow their lead is created by the sides of the broach teeth and by helical chip breakers in each tooth. This principle is illustrated here.

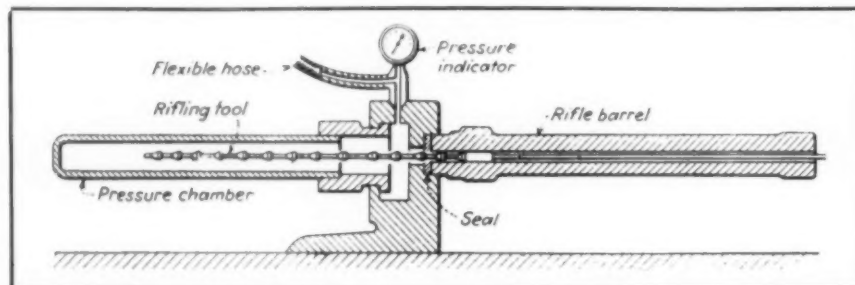


Figure 2. The cutting lubricant is supplied under high pressure which is built up in a chamber slipped over the broach after it has been inserted into the barrel.

- (3) Lock pressure chamber in position and start pulling cycle.
- (4) Remove first pass broach and reverse ram.
- (5) Remove pressure chamber and insert second pass broach.
- (6) Put back pressure chamber in position and start second stroke.
- (7) Remove broach, reverse ram and remove finished barrel.

Some of the above production figures and estimates of the ultimate tool life are still subject to revision. Most of these jobs have not been running for a sufficient length of time to establish positive figures of this type.

A recent but nevertheless valuable addition to the process of rifling has been the broaching of the round bore. This is done prior to the job of rifling, while it is not necessarily a part of the rifling process, it can be done on the same broaching machines, employing the methods used in rifling.

### Closer Tolerances

Bore broaching improves the finish over reaming and produces uniform diameters throughout the entire length of the barrel. It permits holding closer tolerances. This is desirable from the standpoint of the subsequent rifle broaching because the broaches can be better piloted. The usual stock allowance for bore broaching is from .002 to .004 in. on the diameter.

In bore broaching, contrary to reaming, the direction of the cut and

the tool marks follow more closely the travel of the projectile. Should it be desired that the pattern of the finish follow exactly the lead of the spiral, the finish broach of the rifling set may be equipped with some additional round teeth between the finishing rifling teeth (Fig. 3).

The shop problem of manufacturing rifling broaches was at one time quite a problem in itself. This becomes apparent when it is realized that .30 caliber broaches, for instance, are made of one piece of high speed steel of 52 in. length (Fig. 4). The body of these broaches between the teeth is only about 3/16 in. in diameter while the shank is 1/4 in. For the .50 cal. and 20 mm. sizes the broaches are made with detachable shanks. Another problem is that of grinding

both the faces and the diameters of the teeth with the best possible finish. A high degree of workmanship is absolutely essential in order to produce good barrels.

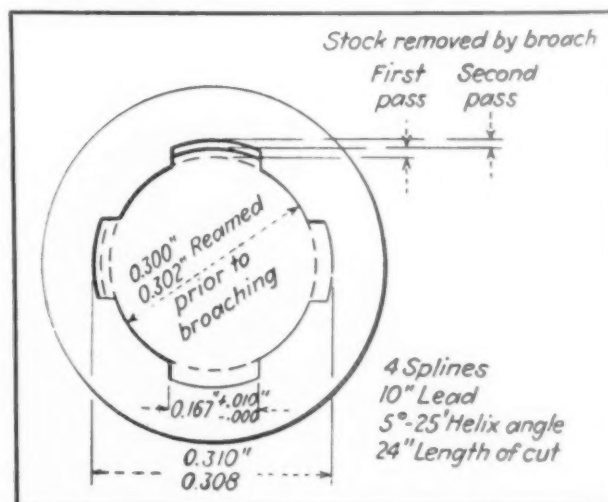
On one manufacturer's screw type rifle broaching machine, the screw is driven through V-belts by a reversible motor. The free-floating, ball bearing, jaw-type puller contains a safety link which protects the broaches against breakage. The by-pass valve of the high-pressure coolant unit is set between 150 and 300 lb. per sq. in. depending on the size and length of the barrel. All oil flows through a filter in order to keep it free of even the smallest particles which might scratch the broach or barrel.

### Broach Sharpening

The principle of the rifling broach sharpening machine (Fig. 5) is similar to that of any other broach sharpening machine. However, for adaptation to its specific duty it is equipped with special steady rests, interchangeable grinding and polishing spindles and a diamond wheel-dressing device. It also has means for quick indexing from tooth to tooth. Radius dressing, grinding wheel diameter, spindle speeds and angular spindle adjustment all combine to assure the best possible job of sharpening.

The rifling broach inspection fixture, (Fig. 6) provides for visual inspection through a microscope of 20 times enlargement. The size and steps of the broach teeth are checked by a snap-gauge indicator arrangement. Visual inspection of the broaches determines whether they have remained free from pick-up. Inspection follows sharpening to ascertain that every trace of dullness has been removed.

Figure 3. Should it be desired that the pattern of the finish follow exactly the lead of the spiral, the finish broach of the rifling set may be equipped with some additional round teeth between the finishing rifling teeth.



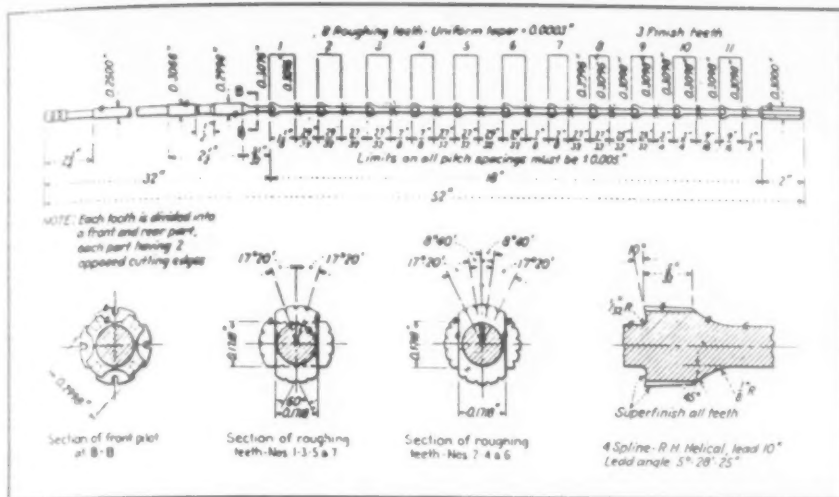


Figure 4. Complicating the task of rifling broach manufacture is that .30 caliber broaches, for example, are made of one piece of high speed steel 52 inches long.



Figure 5. The principle of the rifling broach sharpening machine equipped with special devices and adjustments, is similar to that of any other broach sharpening machine.

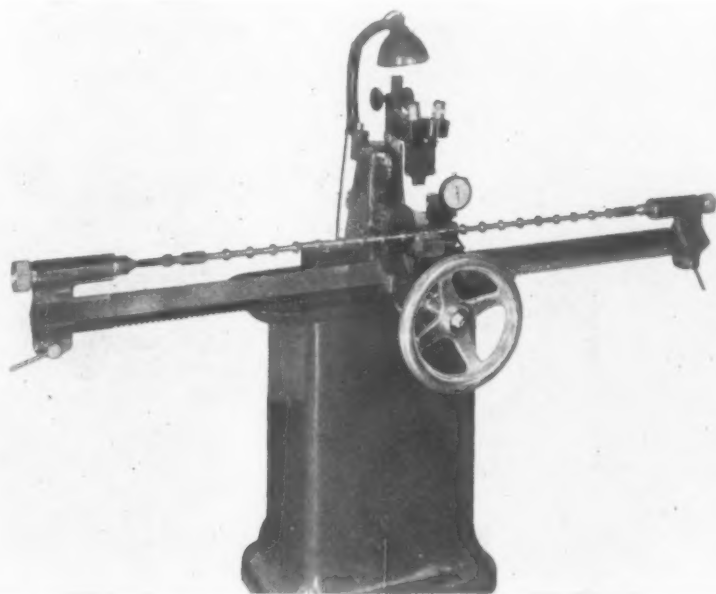


Figure 6. The rifling broach inspection fixture provides visual inspection through a microscope of 20 times enlargement.

AUGUST, 1942

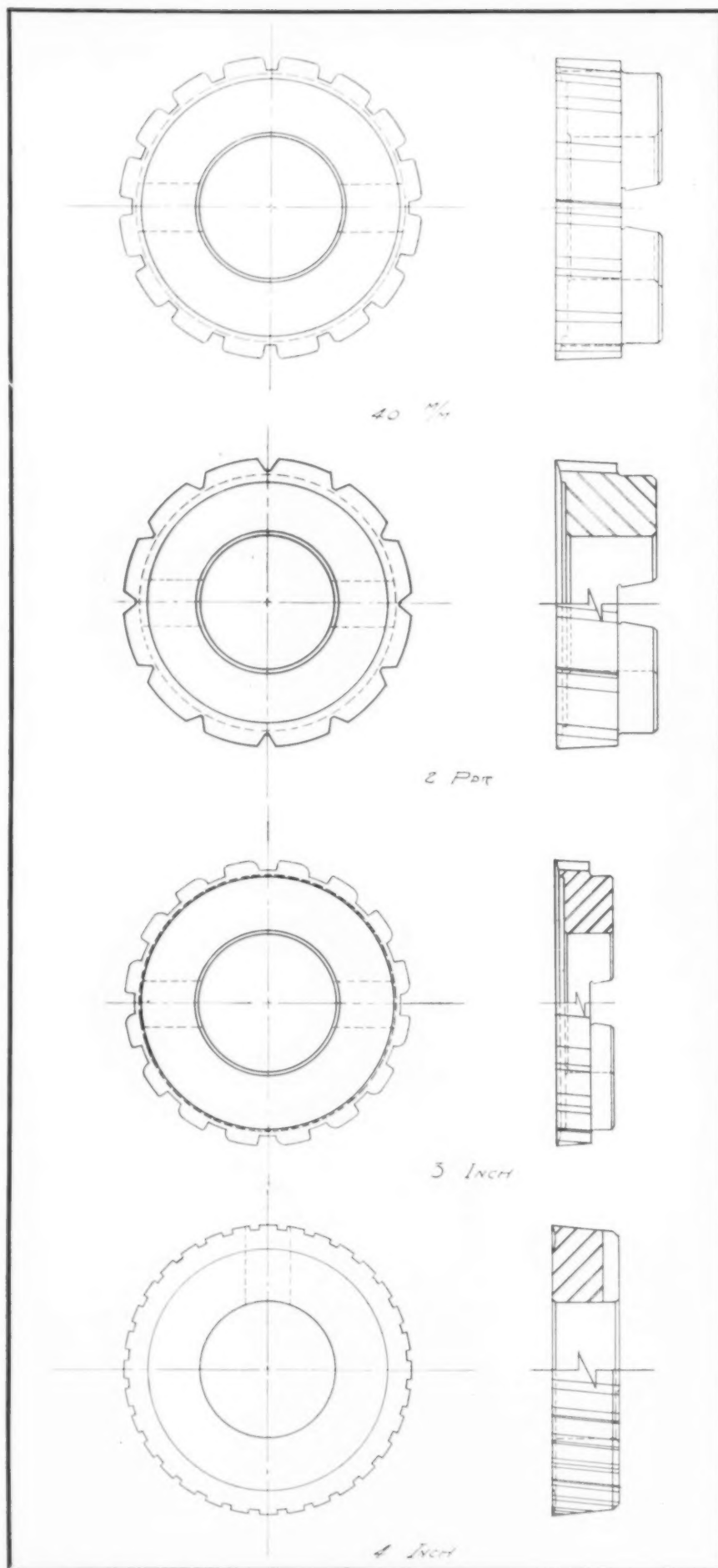
Sharpened broaches must be checked on the diameter as well as on the face of the teeth. For face inspection the broach is swiveled to a high angle position.

## Large Guns

The first successful rifling by broaching in 1938, was done on .30 caliber barrels because they were then the only high production gun. The present war, however, has brought out a number of heavier caliber rapid fire guns. For instance, .50 caliber and 20 mm. guns are now produced in large quantities. It stands to reason that guns of this size are more easily broached than the .30 caliber size.

Large guns, those with a bore of 40 mm. and up, are successfully rifled with individual cutters, sometimes referred to as wafer cutters (Fig. 7). This method is also a broaching process with the cutters representing individual broach teeth. While the individual cutter method dominates the large gun field and the solid rifling broach the small arms field, the two methods seem to meet each other on the one in. to 37 mm. sizes. These diameters appear to represent the upper limit at which broaching with solid broaches is still economical. At the same time it is the lower limit at which individual cutters may still be considered practical. Difficulties with lead errors are experienced on smaller sizes due to the weakness of the push rods.

Larger guns are rifled, as stated above with broaching cutters. These are pushed through the barrel in order to get chip room. Only one cutter goes through at each stroke. This cutter is removed from the head at the breach end at the finish of the cut and the push rod or cam rod is drawn back. Then the next cutter is attached and the cycle continues until the required depth of grooves is reached. The saving of time with this method is considerable. It takes 32 cutters to broach a 40 mm. gun to the depth required. The 40 mm. gun carries 16 grooves. If, therefore, the barrel was grooved with a single pointed tool and this tool took a chip equal to the tooth in a circular cutter, it would take 16 times the number of strokes of 16 x 32 — 512 strokes of the machine against the broaching figure of 32. This is somewhat offset by the fact that the operator must unload



and load the cutters when starting or finishing the cut. The machine must also be stopped, while with single tool bits the machine operates continuously until the tool has gone round the periphery of the barrel, then the tool has to be reset for next depth of cut. The actual time for a single tool to broach this barrel is between six to 10 hours, while with circular cutters the barrel has been broached in 55 minutes. This time has now been stepped up to 90 minutes as it has been found that by not crowding the cut, the life of the cutter is increased. The circular broaches on the 40 mm. have broached between 270 and 300 barrels between sharpenings. Concerning the actual life of the broach, the original set is still in use after more than a year's production and no visible change can be seen. The 40 mm. gun presented one very outstanding feature to overcome, namely the increasing pitch of the spiral. This spiral starts at the breech at approximately  $4^\circ$  and increases to about  $6^\circ$  at the muzzle. Clearance had to be provided for on the side of the teeth to take care of this variation.

#### Provision for Oil

Because the diameter of the barrel was quite small, provision for oil also presented a problem. The oil is provided from the back and is supplied to the front, going through the flutes which are approximately  $1/16$  deeper than the depth of cut. This has a tendency to wash the chips ahead of the cut. I have seen broaches that had the oil supplied in front of the broach only, but this does not work out as well because it washes fine chips back, which have a tendency to drag between the broach head and the barrel. If such is the case, scores of grooves show up in the barrel. If these are too deep to be removed by honing they scrap the barrel. One thing that gave trouble before it was rectified was, that the broaches seemed to give a certain wave in the cut. Too sharp cutting edges on the cutters proved to be the cause. After the cutters are sharpened the cutting edge itself is now dulled slightly by honing and the barrels come out clean and with high finish.

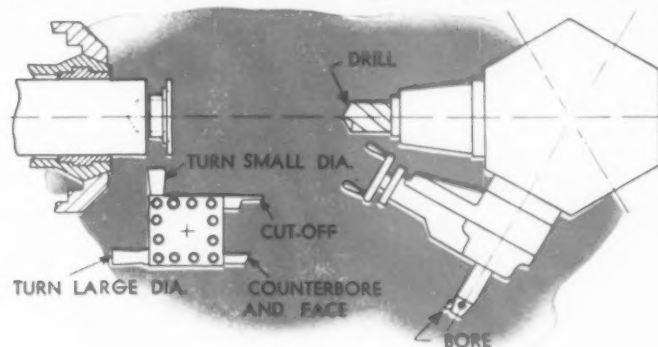
Figure 7. Large guns are rifled with individual cutters, sometimes referred to as wafer cutters.



# A Citation for MEN in WAR INDUSTRY



## His "Head Work" Eliminated a Second Chucking Operation



Joe Karnowski mans a turret lathe in the Strut Department of Bendix Aircraft, South Bend, Ind. Along came a complicated collar job with the routing book calling for two chuckings. But operator Karnowski, like thousands of other skilled mechanics, thinks beyond routine work sheets. By rearranging the tooling, he was able to finish the work in *one* chucking, saving valuable time otherwise spent in rechucking for a second operation. The finished piece is also more accurate because in a single chucking all faces are square and the hole concentric. We are proud to present operator Karnowski with a gold victory pin for his contribution to "Ideas for Victory".

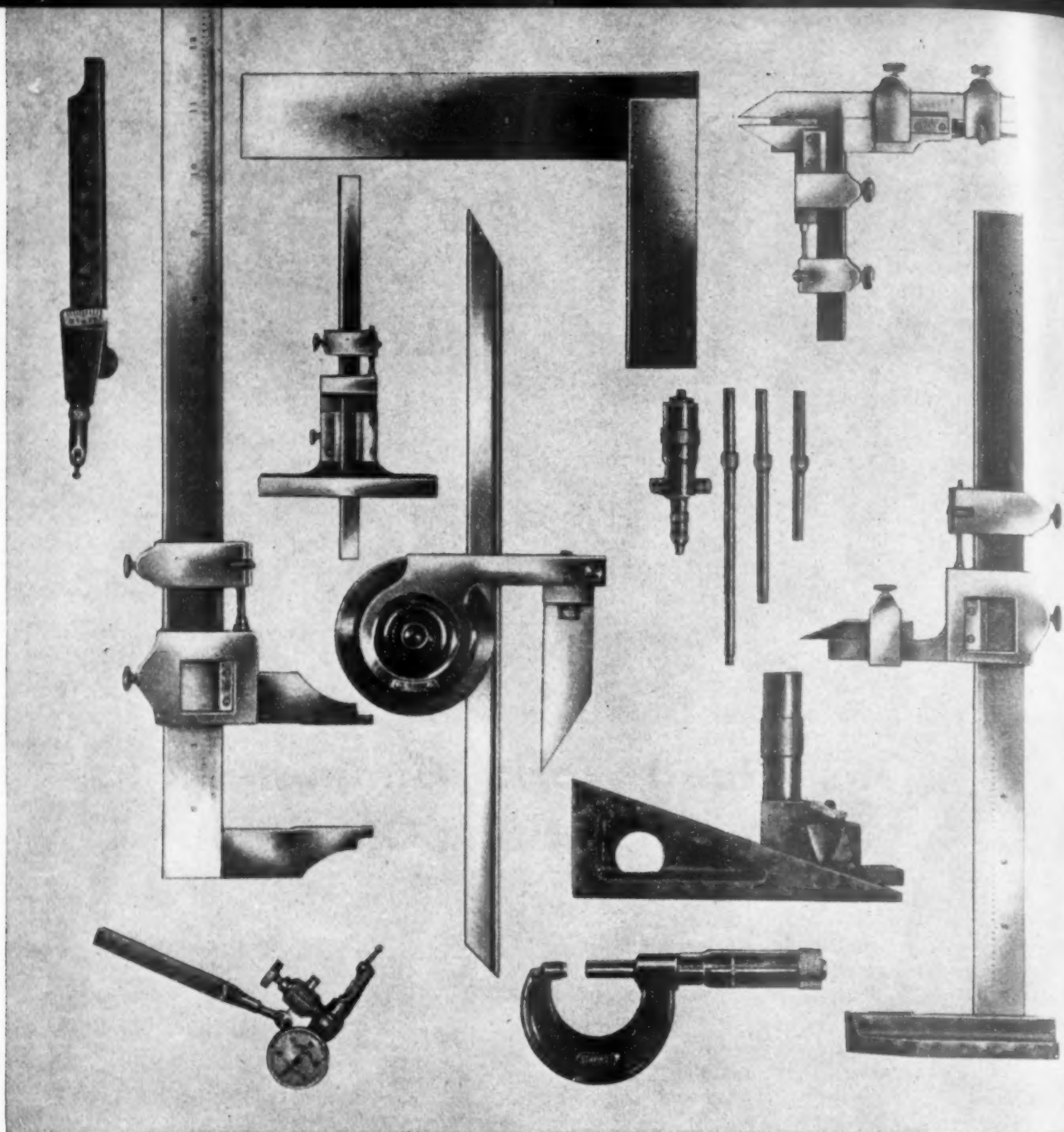
Hundreds of resourceful operators send their "Ideas for Victory" to be published in "Blue Chips", a newsy shop bulletin sent free to turret lathe operators' home addresses. Make sure *your* operators—old timers and learners—are on the list to get "Blue Chips". They'll enjoy it and profit through reading it. Write Warner & Swasey, Cleveland, Ohio.

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LESS... WITH A  
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## **Today's Need:**

# Tool Engineering

**Tooling has become of vital importance. Does management realize how necessary it is to tool-up adequately to meet production demands?**

**FRANK W. CURTIS**

*Chief Engineer, Van Norman Machine Tool Co.*

**B**EHIND the production requirements for our armament manufacture lies the vast utilization of Tool Engineering in its broadest scope, because Tool Engineering deals with practically every phase of manufacturing required to convert a piece of raw material into a finished product. The Tool Engineer's main objective may well be summed up as the creation of methods and principles that make possible the output of a product . . . "with inherent accuracy to add to its dependability; at a cost that will broaden its field of application; and in quantities that will make its manufacture practical and attractive to management." A full realization of the science of Tool Engineering, therefore, becomes the first step in achieving supremacy in quantity production, for it is the creations and achievements of the Tool Engineer to which we so deeply depend for the successful output of armaments in time of war, just as we have in the past for peace-time products.

During the past few years, management has learned to realize that Tool Engineering is the "backbone" of successful manufacture. Not so long ago, however, some executives were not too familiar with the so-called hidden advantages of tooling, and looked upon special equipment as some kind of an unnecessary overhead that merely "cost a lot of money." Today,

the picture is quite different. Tooling has become of vital importance, and management realizes how necessary it is to tool-up adequately to meet production demands within stipulated costs.

Those engaged in the field of Tool Engineering know, perhaps better than anyone else, that tooling cannot be valued by its cost. Cost is a factor, of course, but performance is what counts and what we must attain if our tooling is to be successful. Let us not forget that more can be accomplished with highly specialized tooling in a machine tool of an earlier model, than through the use of a most efficient and modern machine with inadequate tooling, something that could be likened to "hitching a race horse to a plow."

### **Production depends on tooling**

Good management, nowadays, looks upon tooling as a "blue-chip" investment that will yield a return far greater than any other form of overhead expenditure. To produce at less expense, within accurate requirements, and in larger quantities . . . with armaments now and consumer goods later . . . executives are fully awake to the fact that tooling takes a place high in the ranks of manufacturing necessities. If we could always remember, that tooling to a machine

is a lot like fingers to a human hand, and then realize how useless a fingerless hand would be, we would then get a very excellent picture of the importance of tooling in its broadest sense.

Management will do well to lean more heavily on Tool Engineering for the successful turnover of products, whether armaments or other forms of equipment, because competent Tool Engineers are now considered as important as consultants. They have the ability to process parts economically, they can evolve ways to get the most out of machine tools by creating jig and fixture designs of a superior nature and small tools and cutters to correspond, they can lay out efficient gages and inspection equipment, as well as develop progressive assembly methods, and then carry through by seeing that all their contributions work out as they should. Largely, this is a complete manufacturing service, which clearly shows how Tool Engineering serves industry.

If we made a comparison of two plants producing similar products, the more successful of the two would be the one in which management has become educated to the miracles of tooling by realizing that jigs, fixtures, dies, and other forms of special equipment . . . instead of being merely an overhead evil . . . are in reality the measuring stick of success.

### **Design vs. Tool Engineering**

Tool Engineering as a science has made possible the increase in volume of a more saleable product with decreased factory costs. This might seem a casual remark, but when we analyze its significance the result is that new markets are made possible through volume production so that the mass may enjoy luxuries rather than a mere handful. The production of products at lower costs opens new markets because of increased demands; in other words, mass production or the producing of products at low costs means mass sales. To illustrate the point, let us consider the mechanical refrigerator. When first introduced, the average unit cost in the neighborhood of \$1,000.00. Today, the same unit costs but \$100.00. The earlier models required servicing and the replacement of parts, and on the whole they were none too dependable. The refrigerator of today, however, runs trouble-free, and at less operating cost because it is made more ac-



curately, through the application of Tool Engineering principles.

When a design or an idea is born, we should first look to the Tool Engineer to offer his final analysis of whether or not the product can be successfully made. In plants where this practice has been adopted, the Tool Engineer has the opportunity to analyze the product from a production view point, and without any selfish motive whatever can be very instrumental in showing how certain changes and modifications can be made to eliminate expenses and costs which might otherwise be overlooked. Often, the product can be picked apart, piece-by-piece, enabling redesign, if necessary, to conform with modern-day manufacturing practices.

We should always remember that the design of a product is one thing, and the method of making it is another. Both must tie in with each other, because any product, no matter how efficient it may appear, is no better than the tools used for its manufacture. The Tool Engineer, therefore, is as important in our industrial cog as the designer, who is called upon to develop a product, because without tools and a means of producing economically the most needed type of product would be restricted. The Tool Engineer, therefore, should become recognized as a part of management.

#### **Retooling automobile plants**

Although our automotive industry has had the reputation of leading the world in devising mass production methods, applying the usual automobile system of manufacture to the building of munitions and armaments has taxed the ingenuity of Tool Engineers no small amount. Nevertheless, the automotive technique of mass output has been adapted quite rapidly in an effort to fill our "all out" war needs, and many predominating examples of cost-cutting ideas have already been evolved during the six months since Pearl Harbor. Methods have been developed to cut thousands of hours from original estimates, while new devices of various kinds have shortened the road to Victory from a standpoint of labor efforts, thanks to Tool Engineering.

The speed with which this industry has changed from peace-time products to armaments is amazing. Through the installation of modern

tooling and mass-production methods, the average plant is reported to be running from one to five months ahead of schedule, in building products ranging in size from small bullets to heavy bombers, and including plane and tank guns, shells, anti-aircraft guns, tanks, instruments of all kinds, plane motors, marine engines, and many more.

#### **TOOL ENGINEERING AND INTERCHANGEABILITY**

Tool-Engineering has had an enormous effect upon nearly every phase of the advancement of civilization. The cost of automobiles, refrigerators, radios, and many other products would be far beyond the reach of the average man if it were not for the science of Tool Engineering. Not many years ago, interchangeability of parts was considered an expensive undertaking, limited only to the production of products in exceptionally large quantities. Today, however, through the close study of manufacturing methods, most any type or style of product can be made interchangeably, even though the output may be considered relatively small.

An outstanding achievement in Tool Engineering was the rapid entrance into the aircraft production. Shortly, the automotive industry, including car and body builders, will be producing planes in quantities exceeding the reputed output of all European nations. For all this, tooling has played a most important part, as can easily be conceived.

Another phase of the flexibility of the automotive industry is reflected in the building of tanks. According to recent figures, our tank output is already exceeding that of the Axis powers, and, in fact, is exceeding our own expectations.

#### **Tool Engineering and the post-war period**

Of great interest to the Tool Engineer and the science of Tool Engineering will be the post-war period. The war efforts have resulted in the development of processes and products that otherwise might have been delayed. These new achievements will be available to industry after the war, and it will be another problem for the Tool Engineer to make it pos-

sible for these discoveries to be applied and made available for public consumption.

Automobiles and airplanes are two outstanding products that will derive the benefit of scientific research and thus create a vast number of changes in our way of life. Just what the automotive engineer will do after the war is still a secret, but it is safe to assume that the industry will be reborn, as will many others.

America's increased capacity in the production of aluminum and magnesium will bring about a tremendous expansion in the use of light metals for automobile uses. These metals will, no doubt, compete with steel for many purposes. Plastic materials will be available in larger quantities than ever, and automobile bodies of plastic design are quite possible to conceive. Plastics capable of withstanding heavy blows are already available for many war uses and will find even more uses in peace-time.

A fuel many times more powerful than gasoline has been produced, which will require entirely new automobile engines because present designs are not able to use it. This fuel is of a very high compression type that will require a small, high-speed motor with a greater power per pound of weight than present motors.

#### **Mass-produced aircraft**

Since airplanes depend on lightweight motors, these engines will probably be used in the large number of small planes that will be produced after the war, so that a new era of civilian flying can be expected, especially, with the thousands of army and navy trained pilots who will want low-cost aircraft of their own. The rapid strides made in the building of warplanes have been made possible only under war emergencies, where speed has been so urgent. The mass-production methods will carry over to peace-time, so that we may expect the air to rival the road as a means of travel.

All these developments and many more will open up new manufacturing problems for the post-war period, and again we shall turn to the Tool Engineer for his achievements in solving the many problems that will arise, because without the full force of Tool Engineering behind our manufacturing plants, economical production would be impossible.



Bell Aircraft Corp.

## Government Problems In

# Defense Inspection

*A. R. Burgess*

Captain, Ordnance Department, St. Louis Ordnance District

ONE of the most difficult problems associated with government inspection is that of convincing the average industrial engineer that there is a genuine need for thorough government inspection, and that such inspection necessarily has certain peculiar features not ordinarily encountered in commercial practice.

A mutual understanding of the problem can greatly facilitate the solution of our common task of producing the greatest amount of the best military equipment the world has ever known.

A serious difficulty confronting us is the fact that there is no satisfactory performance test for a great many of our products, except that of actual functioning in service, and once the item has so functioned, it is completely destroyed. A cartoon which appeared recently in one of the popular magazines illustrated this point rather well by showing a sweating, burly inspector standing in front

of a long line of shells with a sledge hammer in his hand. He had just hit each shell on the nose with the sledge. The caption said simply, "Just as I thought, every one of them is a dud."

Obviously it is not practical to test shells by hitting them with a sledge hammer, so we must resort to a process of inductive reasoning in which we argue that if shell made to certain di-



"... failure is all too frequently accompanied by disastrous accidents"

mensional tolerances, physical properties, weight limits, and so on, are found to function satisfactorily, then all shells made to the same limits will function according to the same standards of performance.

## Establishing limits

Our problem then, is one of establishing limits such that all items within those limits will meet the requirements of the extraordinarily severe conditions imposed upon Ordnance Materiel. Few persons are aware of the severity of those requirements. The fact is that the conditions of operation of Ordnance Materiel have no comparable parallel in ordinary commercial practice. When a shell, for example, must accelerate to 3,000 feet per second in the brief space of six feet, it must receive a terrific boost in back of it—a slap of some 50,000 pounds per square inch. A jolt of that kind is so seldom encountered in commercial design that the average engineer has little realization of the problems of designing a mechanism which will operate properly in the split second time available, and under the tremendous pressure and inertia forces existing in the bore of the gun.

It is more than just a matter of producing an item which will work to some extent. It is also a question of producing an item which will give the greatest practical degree of perfection in functioning. In the case of a projectile fired from a gun, for example, (and despite the many spectacular new weapons which have been developed through technological progress, shooting a projectile from a gun is still the most widely used and effective means of compelling the enemy to withdraw) the accuracy with which it is possible to make that projectile reach its desired destination depends to a large extent upon the accuracy with which that gun and projectile have been manufactured.

Even though we have highly skilled marksmen and these gunners take elaborate pains in laying their fire on the objective, there is no assurance that the shell is going to hit its target. There are too many factors involved over which the men in the field have no direct control. The muzzle velocity of that shell will depend on the chemical properties of the burning powder which propels it, the weight of the shell itself, the dimensions of

the gun barrel, the fit of the shell in the gun, and so on.

The net result of all these variables is to cause the shell to deviate from its desired flight so that it does not travel as straight and true as intended. This means that the gunner can rely only on the fact that all shells will fall within a certain zone of impact and that eventually one of them will find the target if it lies within that zone. However, the greater the variation in the dimensions of the

shell and the gun, the wider will be that zone and the less will be the chance of striking the target with the shell. Thus ammunition is wasted and perhaps the gunner fails in his mission and the success of the engagement is seriously jeopardized.

Perhaps an even more serious feature of the failure to produce Ordnance Materiel accurately to the required dimensions is the possibility of complete failure of that materiel in the field, especially since that fail-

ure is all too frequently accompanied by disastrous accidents. You must appreciate the fact that because of the severe conditions imposed upon these items in service, the safety factor is very low, and we are continually treading dangerously close to the brink of success with the abyss of failure yawning below. A single misstep may throw us over from correct functioning to an extremely serious accident, and the effect of that accident cannot be measured simply in the number of soldiers who may be wounded or killed at the time. When a soldier is killed by enemy action, his comrades may regard it as the fortunes of War and be all the more determined to overcome the enemy. But when a man is killed by defects in equipment which has been built by people back home for whom he is fighting, it is readily understandable that his comrades may lose enthusiasm. In any event, they are certain to lose confidence in the equipment they are using, and once that confidence is gone, prosecution of a successful campaign is extremely unlikely. These men are naturally tense and on edge, and it is hard enough for them to carry on their fire with the necessary precision, without also being disturbed by the possibility of their own equipment failing.

#### Interchangeability of parts

Another problem that confronts us is fundamentally simple enough, but gives quite a bit of trouble in actual procurement of war materiel. I am speaking of the necessity for complete interchangeability among the parts which the government purchases. Conditions in the field are not conducive to easy assembly of parts, especially if selective assembly is necessary. There are no screw machines set up in the field to re-tap threads which prevent pieces from screwing together.

Every component piece must mate with every corresponding piece. A manufacturer who is making a male plug to screw into a female piece may look at the pitch diameter of the plug and the pitch diameter of the female thread and note a clearance between them of some .0004 or .0005 of an inch. He is tempted to allow the pitch diameter of the thread on the plug to go beyond the maximum prescribed on the drawing on the theory that pieces will still go together because he has

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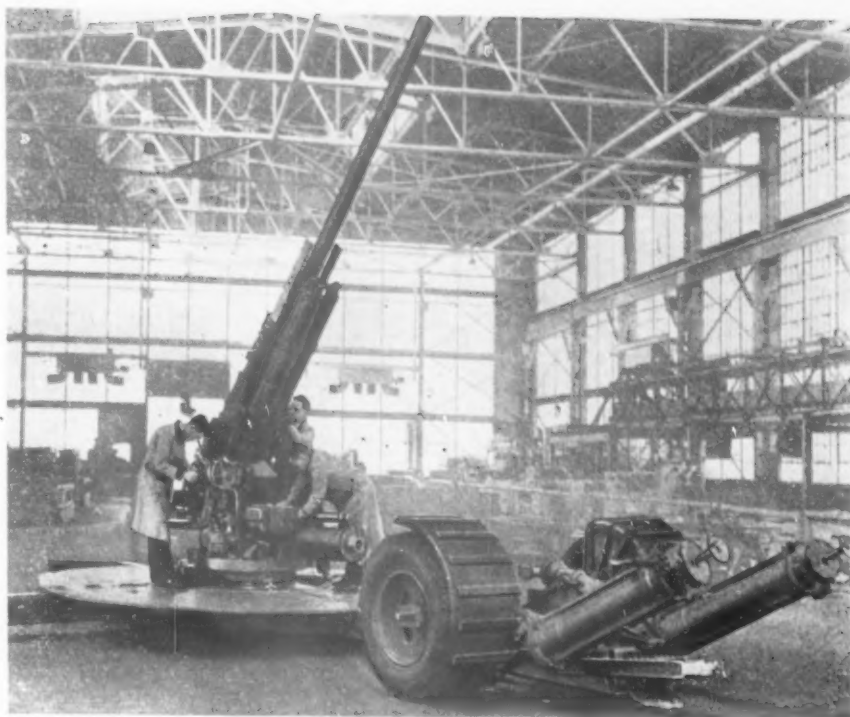
not used up all the clearance. At the same time, the man who is making the piece with the female thread may operate on the same theory and let his taps wear down until the pitch diameter on that thread starts to use up some of the clearance. If both manufacturers go beyond the drawing limits, then at some future date the female threads which were made a little too small and the male threads which were made a little too big are going to meet up and somebody in the field is not going to be able to assemble them.

A further reason for interchangeability is the fact that the final assembly of an item may take place at a point far removed from the origins of the component pieces. A complete round of ammunition, for example, may come from widely separated points. The shell forging may have been made in Colorado, and have been machined in Nebraska; into that machined shell may be placed a booster made in Missouri. Ahead of that booster may be inserted a fuze from Ohio and the whole assembly may be put together in a loading plant in Kansas. Tool Engineers fully realize that if each of these parts is not held to the drawing limits, it will be impossible to assemble them.

### Accepting outside limits

Still another problem frequently confronting the Ordnance Department is the fact that private contractors believe they know much more about the design and functioning of Ordnance Materiel than the Ordnance Department. With annoying frequency the argument is presented to us that component pieces made slightly outside of the drawing tolerances will function just as well as those pieces made inside the tolerances. Quite often it is true that, in the light of limited knowledge and from a casual inspection, the argument is valid. Unfortunately however, the only way that we can be even comparatively sure that a mechanism is going to work is that it is made to the same limits as other mechanisms which do work.

Whenever the Ordnance Department is asked to accept pieces outside limits, there is only one way it can be certain such pieces will make a satisfactory assembly; and that is to put the pieces together, and try out the finished product. But that proc-



**This anti-aircraft gun built by Fisher Body can knock down bombers about seven miles high. A variance of .001 of an inch in one part of the gun will cause the projectile to miss its mark by more than 60 feet, likewise cause the gun to be rejected by Army Ordnance inspectors.**

ess of experimental design and proof testing is arduous and expensive and requires time not being granted to us by the enemy. We have trouble enough developing and testing new designs for specific tactical uses without investigating all possible variations of established design in order to adapt it to the manufacturing problems peculiar to a dozen or more separate producers. Moreover, if new standards are set up to accommodate the difficulties encountered by one manufacturer, it may be necessary for other manufacturers to make a change in tooling and reorganize their sequence of operations. Obviously, such a procedure would result in a cost and delay which we cannot afford to incur.

### Open to suggestions

This should not be construed as meaning that the Ordnance Department has a closed mind towards suggestions offered by contractors for improving design to facilitate manufacturing without sacrificing proper functioning. However, cases occur frequently in which tolerances have unofficially been relaxed by inspectors and because of this relaxation, trouble has resulted. I have come in contact with too many such instances not to be chary about allowing inspectors to exercise freely their own judgment.

Our practice is to instruct inspectors to adhere rigidly to drawings and specifications, and then present us information on all pieces the inspector feels may be acceptable though they do not conform strictly to specifications.

In addition to the problems discussed, the Ordnance Department has its internal problems, occasioned largely by the terrific expansion of the Ordnance Procurement program. About two and one-half years ago, the staff of the St. Louis District Office consisted of two people—The Deputy District Chief and his secretary. Today the District employs more than a thousand people. These people work in an area covering eight and a half states and the greater majority of them have to be put out on jobs almost completely removed from immediate supervision by the District Office. All these men are new trained for the job. Much of this training has been accomplished by sending the inspectors to one of the six manufacturing arsenals. Although this training has been of inestimable value, much of the knowledge these men need is similar to that required to be good tool designers. Knowledge of this type cannot be gained in a few weeks of study.

Hence, there is only one safe course

for us to pursue and that is to hand these new men the drawings and specifications and say to them "here is what you are supposed to accept. If any pieces are presented which do not lie within that range, reject them tentatively and report the circumstances to your superior". In a great many instances the District Office decides that the material is acceptable. Then again it may be necessary to present the facts to the Office of the Chief of Ordnance in Washington for a deci-

sion by the men who originally designed and tested the item.

Our problem is basically different from the problem in a coherent, integrated manufacturing plant. In such a plant, if parts come off the production line which will not quite pass the gages, the inspector can take the matter up directly with the engineering department, who can make a decision right on the spot. In our organization, the engineering department is well removed from the inspector in

the field, and it necessarily delays the process of acceptance of parts outside of the drawings and specifications.

### Large Investments

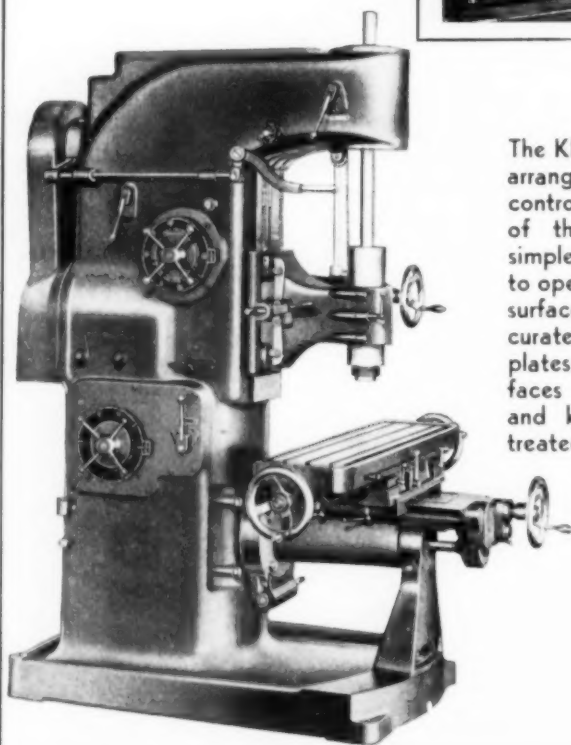
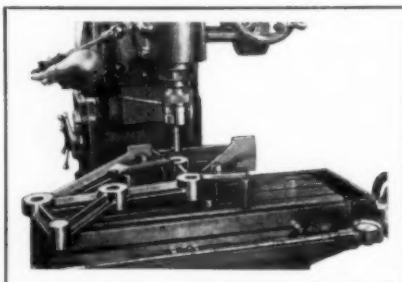
One of the arguments most frequently advanced by contractors in urging the government to accept materiel which does not quite meet the requirements of drawings and specifications is that it is poor economy to waste what may be perfectly usable parts and complete assemblies. But the question of economy extends much farther than simply the number of pieces rejected as compared to the number of pieces accepted. If an operator fails to take the necessary few seconds required to remove the burr from the pin of a fuse, that burr may cause failure of the fuse to function. The total cost of that fuse might be about \$1.50 and that fuse might be assembled in a complete round of ammunition which costs \$25.00 or \$30.00. Under present circumstances, that ammunition, in all probability, will have to be transported over thousands of miles of water. Some of it may be lost by enemy action enroute. It might then be used in an eight or ten thousand dollar gun which had to be carried across that same water, and it will have to be operated by men who were transported across the ocean after having been put through an extensive and expensive training program in this country. It is obviously to our advantage and the advantage of the country as a whole to make sure that all of this investment is not stultified by the failure of an operator to take a few seconds time to remove a burr.

Constantly confronting inspectors is the problem of correct interpretation of specifications. The United States Government, as you know, is the largest purchaser in the world. For its own protection, it has set up certain blanket specifications which cover a very wide variety of material. As a result of this, whenever a particular item is purchased, the natural temptation is to use an existing general coverage specification rather than

## SIMPLICITY OF OPERATION

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out Jigs or Layout →**



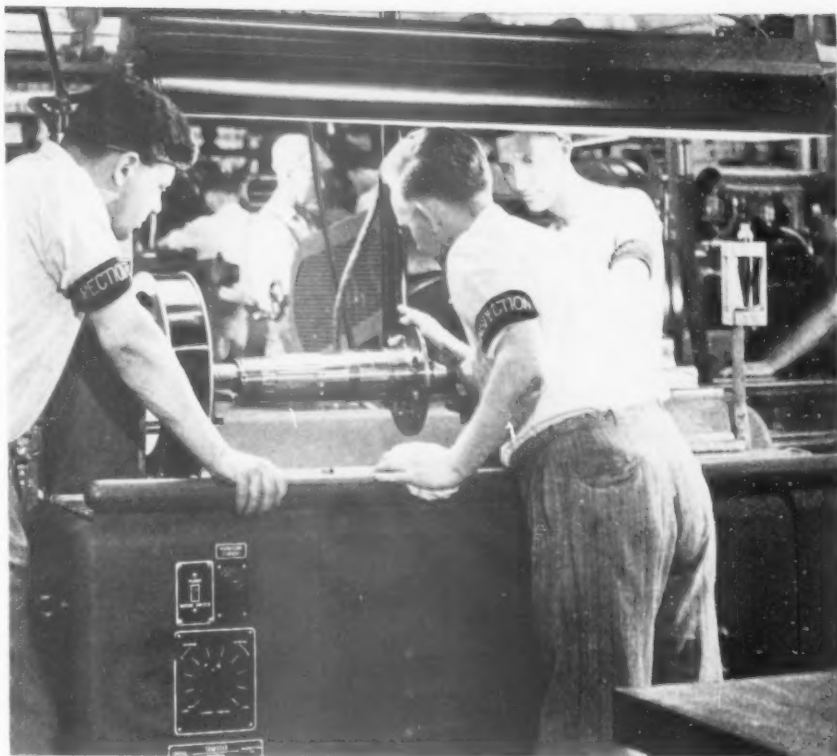
The KNIGHT MILLER has an arrangement of a single set of controls governing the action of the machine which is simple, easy and convenient to operate. The large bearing surface on the column is accurately scraped to surface plates, as are the bearing surfaces on the table, saddle and knee. Gears are heat treated, finished and shaved for perfect tooth contour and mounted on short shafts for strength and rigidity. Anti-friction bearings are used to support all shafts and make for **ACCURACY.**

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to write a complete new specific specification for that particular item. In fact, it would be a hopeless task to attempt to write up separate specifications for each item procured. Consequently, specifications are not always as precise as they might be and frequently specifications must be carefully read to determine exactly what is meant by the wording used. Because of the fact that different constructions can be placed upon the wording of the specifications, disputes occasionally arise between the Resident Inspector and the contractor. Thus delays may occur before the matter can be straightened out.

A complaint frequently heard is that government equipment is not designed for quantity production. Usually that complaint can be traced to the fact that the tolerances are tighter than those ordinarily used in commercial practice. By and large, those closer tolerances are necessary because of severe operating conditions under which Ordnance Materiel must function. Occasionally, it may be true that the tolerances are closer than necessary, and whenever that is true, every effort is made to liberalize them. So far as adhering to the principles for designing for production are concerned, however, the Ordnance Department need make no apology.



Inspection of parts for Rolls-Royce Engine built by Packard.

Proof of this is a sentence from the Drafting Room Regulations of the Ordnance Department, a sentence which lays down a basic principle I have never heard defined elsewhere, either in an engineering school or in industrial practice. It says, "The

locating points on the drawing, the locating or registering points used for machining the surfaces, and the locating points for measuring or gaging, must all be identical." To Tool Engineers that simple statement is axiomatic but even the elaborate drafting room manuals of some of the largest plants in the country, as well as practically every textbook on design, fails to make that point clear. The Ordnance Department deserves credit for the fact that they do try to design pieces for production.

### A Summary of the Problems

For workers, engineers and manufacturers, Captain A. R. Burgess, of the St. Louis District, sums up the problems of government inspection as follows:

First, there is the impracticability of complete functional testing of Ordnance Materiel and the corresponding necessity of establishing dimensional limits and physical properties which will give a reasonable assurance of satisfactory performance.

Second, there is the extraordinary severity of service which Ordnance Materiel operates under, with the accompanying factors, the effect of failure upon the morale of troops and the cost of placing materiel in the hands of troops.

Third, there is the ever present need for interchangeability because of the difficulty of assembling in the field and the multiplicity of sources of manufacture.

Fourth, there is a need of standardized design because of the development of proof testing and the cost and delay incurred when changes in design are made.

Fifth, there are the many internal problems resulting from the terrific rate of expansion of the District Offices.

Sixth, there is the problem of interpretation of specifications, particularly when blanket specifications are used in connection with particular items.

Seventh, there are the problems due to the diverse methods of manufacture used by the arsenals and contractors.

Eighth, there is the problem due to the necessity of wear allowance and gage makers tolerances on Ordnance and contractor's gages.

### Difference of operations

A frequent source of trouble lies in the fact that one of the manufacturing arsenals is ordinarily the pilot manufacturer of component parts. In setting up locating surfaces on a piece, they have in mind the equipment in their shop, which may or may not be the same as the equipment available in the various industrial plants in the country. The sequence of manufacturing operations in the arsenal may be entirely different from that chosen by private manufacturers. Thus, whereas the arsenal may locate from one surface originally and show their tolerances referred to that surface, because of the fact that the manufacturer's sequence is different he may elect to locate from a different



surface. Whenever this happens there is trouble. When the manufacturer locates from a new surface as a result of some previous operation and his final operation affects two or more dimensions, whatever tolerances he has on each of those dimensions has to be split with the remaining dimension.

The result is that the manufacturer is going to lose some of the tolerance shown on the drawing. When it has appeared that the basic dimensions might be changed without im-

pairing the functioning of the piece, a request for that change is dispatched to the Office of the Chief of Ordnance in Washington. That office usually concurs and the change is made promptly. The point I would like to make is that the Ordnance Department does have a manufacturing sequence in mind when the drawings are dimensioned, and they do design for production.

Much dissension has resulted from the necessary difference between Ord-

nance Inspection Gages and manufacturing work gages. For example, if the dimension of a hole is shown on the drawing as 1.000 plus .010, the dimensions of the plug gages for that hole should be as follows:

Ordnance "Go" plug .....1.0005 plus .0005  
Mfgs. "Go" plug .....1.0015 plus .0005  
Ord. "Not Go" plug .....1.0100 minus .0003  
Mfgs. "Not Go" plug .....1.0097 minus .0003

If there were no need to allow for wear of the gages and no need to allow the gage maker any tolerance, the Ordnance "Go" plug gage could be made exactly 1.0000 and all pieces in which the hole was one inch or larger would be passed by this gage. However, if a gage were made to exactly one inch, after it had been inserted in a few hundred pieces it would be soon worn down below one inch and would start entering holes which were a little under one inch in diameter. The inspector would thus be accepting pieces which were outside the drawing tolerances. In order to increase the useful life of the gage, it is made initially with a basic dimension of 1.0005, so that .0005 of metal can be worn off of the gage before it becomes smaller than one inch. In addition to this wear allowance it is necessary to grant the gage maker some tolerance, so that we show the dimension of the gage as 1.0005 plus .0005 of an inch tolerance. This means that the size of a new Ordnance "Go" plug gage is apt to be any place between 1.0005 and 1.0010.

#### Contractor's "Go" plug

Then, so that all pieces which are accepted by the contractor's gage will pass our own gage, it is necessary that the contractor's "Go" plug is at all times bigger than the Ordnance "Go" plug. If he follows a procedure similar to ours and makes a .0005 wear allowance beyond the largest possible Ordnance gage, the basic dimension of his "Go" plug must be 1.0015. Of course, the manufacturer too must permit the gage maker some tolerance and he may decide to allow .0005 with the net result that the size of his gage when new may be any place between 1.0015 and 1.0020.

On the "Not go" gage a similar situation obtains with the exception that no wear allowance is necessary on the theory that the "Not go" gage does not pass into the work and therefore does not wear out. The proper dimensions of the Ordnance "Not go" plug

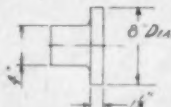
## On these 3 Operations

### 1. INTERRUPTED CUT ON BOILER PLATE RINGS FOR GUN MOUNTS



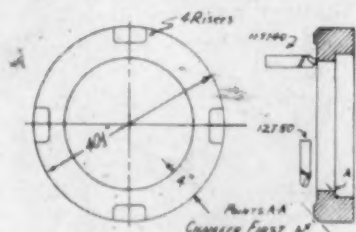
Material: Flame Cut Boiler Plate.  
Speed: 14 RPM; 190 ft./min.  
Roughing: Feed 1/32"—Depth 3/16"  
Finishing: Same Speed and Feed

### 2. ROUGHING AND FINISHING 8" DIAMETER GEAR BLANKS



Material: Rough Forgings SAE 1045  
Speed: 165 RPM; 340 ft./min.  
Turning O. D.: Feed .010"—Depth 1/8"  
Facing: Feed .003"—Depth 1/8"

### 3. FACING AND BORING ALUMINUM RING CASTING



Material: Aluminum Bronze Casting  
Speed: 19 RPM; 200 ft./min.  
Facing: Depth 3/16"  
Boring: Feed .011"—Depth 3/8"

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*Successfully*

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CARBIDE TOOLS  
HAD FAILED**

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would be 1.0100 minus .0003 and the corresponding dimensions of the contractor's gage should be 1.0097 minus .0003. Consequently the net result of these accumulated allowances and tolerances on the gages is to reduce the original component tolerance of .010 by a possible .0026. After all, the contractor can't be blamed for complaining bitterly about this cut in available tolerance, but up to now we have not been able to find any other answer to the problem if fixed gages are to be used.

### Limit Gages

One device which can and has been employed, is to make up a set of limit gages which are right on the component limit. These gages are used only to check those few pieces which have been rejected by the regular inspection gages, and therefore should not wear out during the life of the usual contract.

As is generally known, whenever a part is made in quantity production its dimensions follow pretty much of a normal distribution curve. That is to say, the greater bulk of the pieces will have dimensions which just about split the tolerance. But there will always be a few pieces toward the up-

per end of the tolerance and a few pieces toward the lower end of the tolerance. The big problem, then, is the narrowing down of this normal distribution curve so that the extreme limits within which the dimension can vary remain inside of the drawing tolerance. The first and best answer to the problem of not getting too many oversize pieces, or too many undersize pieces, can be met by the Tool Engineer recognizing this normal variation and taking all possible precautions to restrict its limits.

In simple language this means that tools and jigs and fixtures for the greatest possible accuracy must be designed. It means accurate location of pieces. It means rugged tools and jigs and fixtures which do not spring excessively under load. It means taking the lost motion out of loose bearings. It means grinding cutting tools to the proper angles and using the proper cutting lubricants so that the metal is cut off instead of being torn off. It's no great trick holding to close tolerances with a nice new, husky, pre-loaded spindle bearing, 1943 model machine tool. But it takes a good man to use an old, worn lathe and put jigs and fixtures on that lathe which will enable it to hold to the small toler-

ances found in Ordnance work. That is where Tool Engineers are of tremendous value to the National Defense program.

### Converting Machine Tools

Another way in which engineers can help is in the conversion of universal machine tools, such as an engine lathe, to single purpose quantity production machines. This means designing fast acting jigs and fixtures for loading and unloading, and special tools which can be operated rapidly by comparatively unskilled personnel. It takes quite a bit of ingenuity to design a fixture so that a workman with comparatively little experience or training can get the piece into the machine in a hurry, clamp the handle down and finish it off accurately and profitably.

The Ordnance Department has seen few cases where the contractor has not had to re-tool a job at least once in order to hold to Ordnance tolerances. In every case the proper procedure is to get the job set up and running correctly, instead of trying to muddle through in the hope that the Ordnance Inspector will be lenient and accept pieces beyond the drawing limits.

## War Production Conference:

# Gaging

As part of a War Production Conference held in Boston late in June, questions, answers and formal talks in a special panel on gaging threw new light on numerous important and pertinent phases of gaging as involved in war production.

The meeting was one of a series of regional gatherings of engineers and government production chiefs which were proposed by W.P.B.'s Donald Nelson, as practical forums for the exchange of ideas, and the discussion of mutual or individual problems encountered in turning out unprecedented quantities of military and naval materiel.

In opening the meeting, Chairman Richards discussed the subject of interchangeability. He described the

ever-growing demand for limit gages and gaging fixtures and told of a recent test performed by a well-known engine builder with two motors, each being built and assembled in widely separated plants. Both engines were brought to New York City for test and showed differences of 1.8% in their efficiencies. The two engines were then disassembled and dismantled, the parts mixed up, and reassembled. They then showed a difference in efficiency of only 2%. This, he pointed out, could not be possible without limit gaging of each and every part.

As a motto for every shop engaged in defense work, Richards proposed the following: Q — Q — V., viz: Quality plus Quantity equals Victory. "One is not much good without the

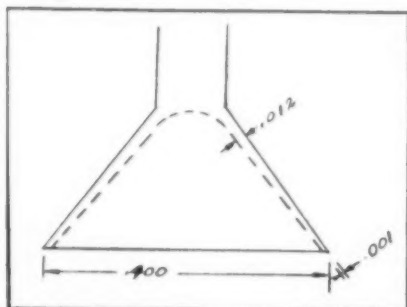
other if we are to attain that goal we are all shooting for—Victory", he said.

The question was asked as to just how accurate a Dial Indicator is. One engineer replied that a .001" Indicator was held to plus or minus .0005 and that a .0001" Indicator had an accuracy of plus or minus .000025". In answer to another question he stated that it was not possible to purchase two indicators to be used on the same job and expect these two indicators to have the same tension unless they were so ordered and tension specified to be the same.

He further stated that it was getting rather difficult to obtain Indicators having jeweled bearings and that there was but a limited supply on hand at present. In answer to a question as to the difference in accuracy of a jewel bearing indicator and a plain bearing indicator he said there was no difference as far as accuracy was concerned but that a jewel bearing indicator had better tension and better control on pivot points. This engineer also said a jewel bearing indicator was

best for use as a strain gage.

A problem of checking wall thickness of a tapered conical part was introduced and a sketch drawn on the blackboard.



Some discussion was devoted to the problem. The solution arrived at was to check the part with a ball point indicator having adjustable stops on frame to locate for location of .012 thickness.

Another engineer described the proper use of projection machines, and stated the accuracy of the various lenses used in these comparators. A discussion was commenced on etched outlines on the glass, and it was pointed out that glass has been used for these etchings up to the present time because glass was nearest to steel on the co-efficient of expansion. The General Electric Co. has introduced a new substance for use in place of the glass and a sample of this product was displayed.

The question of checking lead errors on a projection machine was raised and it was stated that one concern had experienced no difficulty in checking lead errors to .0001". Comparators, it was said, were accurate to .005 to .0001 depending on finish of product being checked. All radii to be checked must be blown up large on a mirror.

Also described is the method used by aircraft engine builders in checking radii at the base of finning on cylinders; also in checking tapered ring grooves for depth and taper. The question as to whether it was possible to change magnification easily on comparators was raised and answered in the affirmative, with the further statement that it takes only a minute to make the change, but that a magnification of higher than  $62\frac{1}{2}$  should be avoided.

In answer to the question as to whether it is possible to do mass inspection on a conveyor system incor-

porating a projector, the answer was yes. There was but few applications in the field, however. One instance was described in checking valve stems at the rate of 12,000 in nine hours on a conveyor system.

One panel member raised the question if it was necessary to move the mirror around to compensate for errors in the adjustment. The answer was no, that it was unsafe to move the mirror, that it wasn't errors in accuracy of the machine so much as errors in electric power operating the instrument.

The possibility of checking ring thread gages on a projector came up for discussion and it was explained that this could only be done by making a plaster impression of less than one-half of the diameter of the thread in the ring gage and this impression checked on the machine by projection. One method used to make impression was a combination of graphite and sulphur.

One expert on thread gaging strongly stressed the fact that all orders for special thread gages where limit gages are ordered should either state the Go and Not Go pitch diameters or state length of engagement.

National Screw Thread Commission Report H-25 1939 Edition shows the various pitch diameter tolerances

for the three different lengths of engagement. He also stated that defense contractors must obtain government drawings of the gages required in order to be sure that their inspection of the product will pass government inspection. Oftentimes contractors will specify thread plug of a certain size only to find out later that the plug thread gage should be furnished with a step or step nuts. Also certain gage drawings put out by the government call for Class X tolerance members on one end of the gage and Class W on the other. This point was strongly stressed.

### Go and Not Go

A problem in gaging was submitted where the Go plug thread gage would not enter but yet the Not Go plug thread member would pass through. This engineer explained this as root diameter interference caused by using a dull tap. He further explained that the Go threaded member is full form and the Not Go is truncated  $\frac{3}{8}$  P. In this problem the crest of the thread on the Go gage would interfere with the major diameter of the tapped hole due to the dull tap and the truncated Not Go would clear the major diameter and bear only on the pitch diameter.

## COOPERATION

General Burton O. Lewis  
Office of the Chief of Ordnance, at War  
Production Conference

As an engineer, I have a keen appreciation of the worthwhile efforts which you gentlemen are making in the War Production materiel field and particularly in the production of Ordnance items. Your genuine efforts are far from business-as-usual achievements.

I have observed during this emergency that engineers generally have not digressed to engage in any self-laudatory and time-wasting meetings that have resulted in an interruption of their work and the endeavors to increase the War Production. Rather, it has been noted, you are interested primarily in **doing more** instead of pointing with pride to what has already been



accomplished by you or your group.

The country turns to you gentlemen at this time when there is urgent need for vastly greater production of war materiel, and I believe that you can effectively increase our War Production by the exchange of practical ideas on the manufacturing problems which are currently arising in your plants.



# Tool Engineering DATA SHEET

## Terms Used in Materials Testing

### TENSILE STRENGTH

The maximum unit resistance the material offers to an applied stress may be defined as "tensile strength." Stress acts in the direction of the axis of the specimen and the unit tension resistance is determined by dividing the original cross-sectional area of the specimen tested into the maximum stress applied during the test.

### YIELD POINT

The "yield point" is the sudden yield found in certain materials which show a permanent increase in elongation without increase in applied stress, and is usually accompanied by a halt of the gage or a drop of the beam under load.

### YIELD STRENGTH

The stress at which a material exhibits a specified permanent set.

### ELASTIC LIMIT

The Elastic Limit of a material is the maximum unit stress which can be applied and removed one or more times without producing a permanent set or any change in the dimensions of the material so tested.

This determination is seldom made in commercial testing as it is a long and tedious operation, it being necessary to start with no load and increase the stress in small increments. After each increase in stress the entire load is removed and the specimen measured. This operation is continued until a stress is found which produces a permanent set, and the Elastic Limit is the last one of the increments which did not produce any permanent deformation in the material.

### ELONGATION

Elongation indicates the percentage of increase in length of a material which has been loaded to or beyond the breaking point. It is usually expressed as the percentage of increase in length based on the original length of the specimen or distance between the outermost gage points or points of reference.

### IMPACT VALUES; CHARPY AND IZOD

The single blow Charpy and Izod impact tests ascertain the work of rupture in foot-pounds or kilogrammeters. The amount of shock energy absorbed in the destruction of the test piece is measured by deducing the energy left in the weight after breaking the test piece from the maximum energy developed at the moment of impact. Results of these tests have not been found to bear any relation to tensile values, and the impact values are readily influenced by slight variations of the test specimens.

NOTE: On this and the following page is the eleventh of a series of Data Sheets to be published in THE TOOL ENGINEER. A handy three ring binder can be secured at any dime store to hold the sheets for quick reference.

## **Terms Used in Materials Testing**

### **REDUCTION OF AREA**

Reduction of Area indicates the percentage the original cross-sectional area has been reduced when the material has been loaded to or beyond the breaking point and is calculated as the percentage reduction based on the original area.

### **BRINELL HARDNESS**

An arbitrary method for determining the hardness of metals by measuring the resistance offered to penetration of a hardened steel ball usually 10 mm in diameter under a given static load. The ball should be the hardest metal obtainable.

### **ENDURANCE LIMIT**

The limiting stress at or below which the material will withstand without fracture an indefinite number of cycles of stress. (Unless otherwise specified, "cycles of stress" refers to complete reversal of stress in flexure or bending.)

### **ENDURANCE RATIO**

The ratio of endurance limit for cycles of reversed flexural stress to the tensile strength of the metal.

### **FATIGUE LIMIT**

Usually used as synonymous with "endurance limit." It has been proposed to use the term fatigue limit to denote a limiting stress for a given specimen as distinct from the endurance limit of the metal, but this usage has not been widely adopted.

### **COMPRESSIVE STRENGTH**

The Compressive Strength (or stress of a material) is the highest compressive unit stress that can be applied and removed without producing a permanent set or any change in any of the dimensions of the material.

### **MODULUS OF ELASTICITY**

The Modulus of Elasticity is the constant which expresses the ratio of unit stress to unit deformation for all values of unit stress not exceeding the elastic limit of the material.

### **PROPORTIONAL LIMIT**

The limit where stress ceases to be proportional to strain is known as "proportional limit."

### **JOHNSON'S LIMIT**

A point on the stress-strain curve, representing a rate of deformation which is 50% greater than the initial rate of deformation is known as "Johnson's limit."

Courtesy of Cramp Brass & Iron Foundries  
Division of the Baldwin Locomotive Works  
Philadelphia, Pa.

What are the elements of tap design that noticeably affect torque characteristics? An engineer well-qualified to discuss this subject provides Tool Engineers with some interesting answers.

# Tap Design

*Vincent O. Stromberg*

Metallurgical Engineer  
John Bath Co., Inc., Worcester, Massachusetts

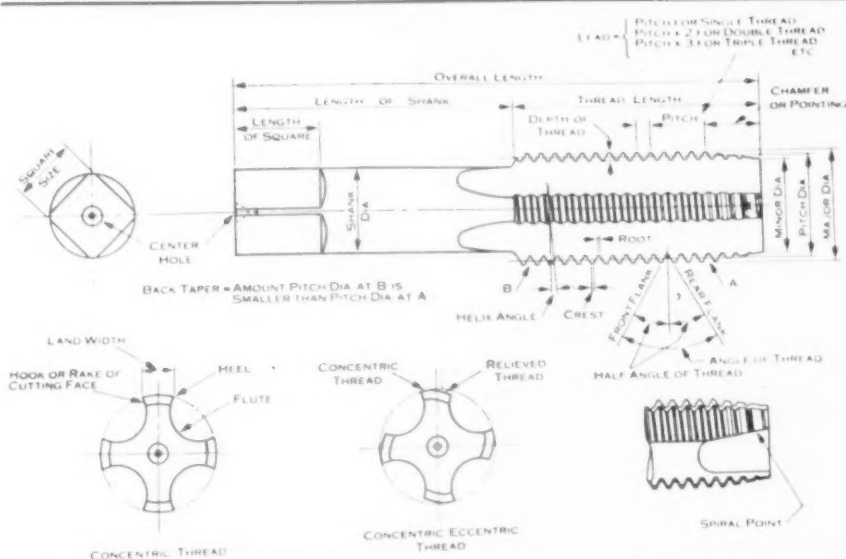


**T**OOL manufacturers realize that cutting tool problems have become much more complex during the past decade and will probably continue to become even more so in the future. This trend has resulted from demands of increased physical properties of parts to be machined. These physical changes are brought about through higher hardness specifications as well as increased alloy specifications. Because of this, tools are called upon to do more work than before.

Thousands of researches have been made for the purpose of producing better cutting tool steels, better heat treatments, and higher hardness and toughness values in these steels. Yet very little work has been done in studying the effects of design on tools made from such materials.

It has been said, and many times proven, that a tool of proper design and inferior heat treatment will out-cut a tool of proper heat treatment but incorrect design. This is due to the fact that the degree of stress which is applied to a tool when it is cutting is dependent upon the shape of the tool; the ability of that tool to stay sharp on its cutting edge is a function of temperature as well as pressure.

This is also true of taps. A tap is a tool that is used to produce internal threads. Like all other tools, it has many elements of design that are necessary in order that the tap will cut a thread in a hole. In Figure 1

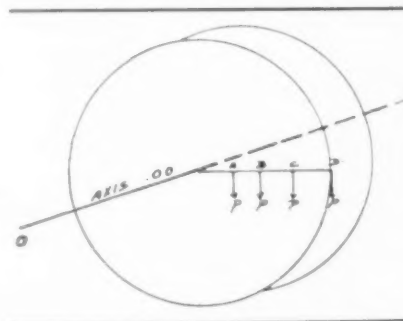


Above, Figure 1, shows elements of tap design and their nomenclature. Below, Figure 2, illustrates the relationship between diameter and torque.

the various elements of design with their correct nomenclature are shown. Each element shown on the cutting end of the tap has effect on the machinability of that tool.

In this article, evidence will be presented to show the effect of cutting power (or torque) on some of these elements of design.

It may be well to show that the power in tapping a thread is affected by the size or major diameter of the tap. If the number of threads per inch (T.P.I.) remain constant and the flutes and chamfer remain the same in design, the percent depth of thread and speed in surface feet per



minute be constant, but the diameter of taps varied, a test can be devised to show a relationship between diameter and torque. It would be analogous to having a disc as in Figure 2



where this disc is free to rotate about axis  $OO'$  and having the constant force  $P$  act on points A, B, C and D of a radius on that disc. It can be seen that the torque on the disc as produced by force  $P$  on D is greater than if  $P$  were applied at A, and that the torque developed about this axis by  $P$  is proportional to the radius.

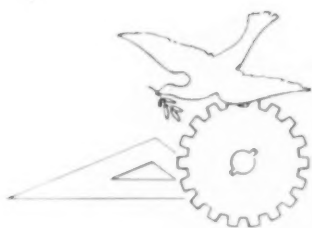
The results of a test, carried out to parallel this analogy, are shown in Figure 3. It can be seen that there exists an approximate straight line

relationship between power and diameter. The slight bend in these curves is due to experimental errors such as chip interference in the flutes, variation in helix angle and errors over which there was no accurate control.

It may also be noted that the slope of the curves depends upon the materials being cut. Cast iron, being easy to machine, does not have a rapid rate of increase in cutting power, while SAE 4150, a material of low machinability has a rapid rate of increase.

If the procedure of this type of test is reversed so that the diameter is made constant while the T.P.I. varied, a relationship between Power and T.P.I. can be established, if, as in the preceding case, all other factors remain constant. The results of such a test are shown in Figure 4.

It will be seen here that the power approaches zero as a limit when the T.P.I. is increased; and the power approaches infinity as a limit when the T.P.I. decreases. So between those two limits the curves for Power as affected by T.P.I. are established and would represent a hyperbolic function, the constant of which depends upon the material being cut and its machinability rating.



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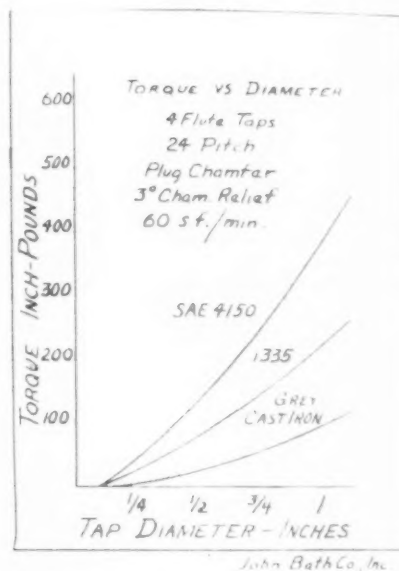


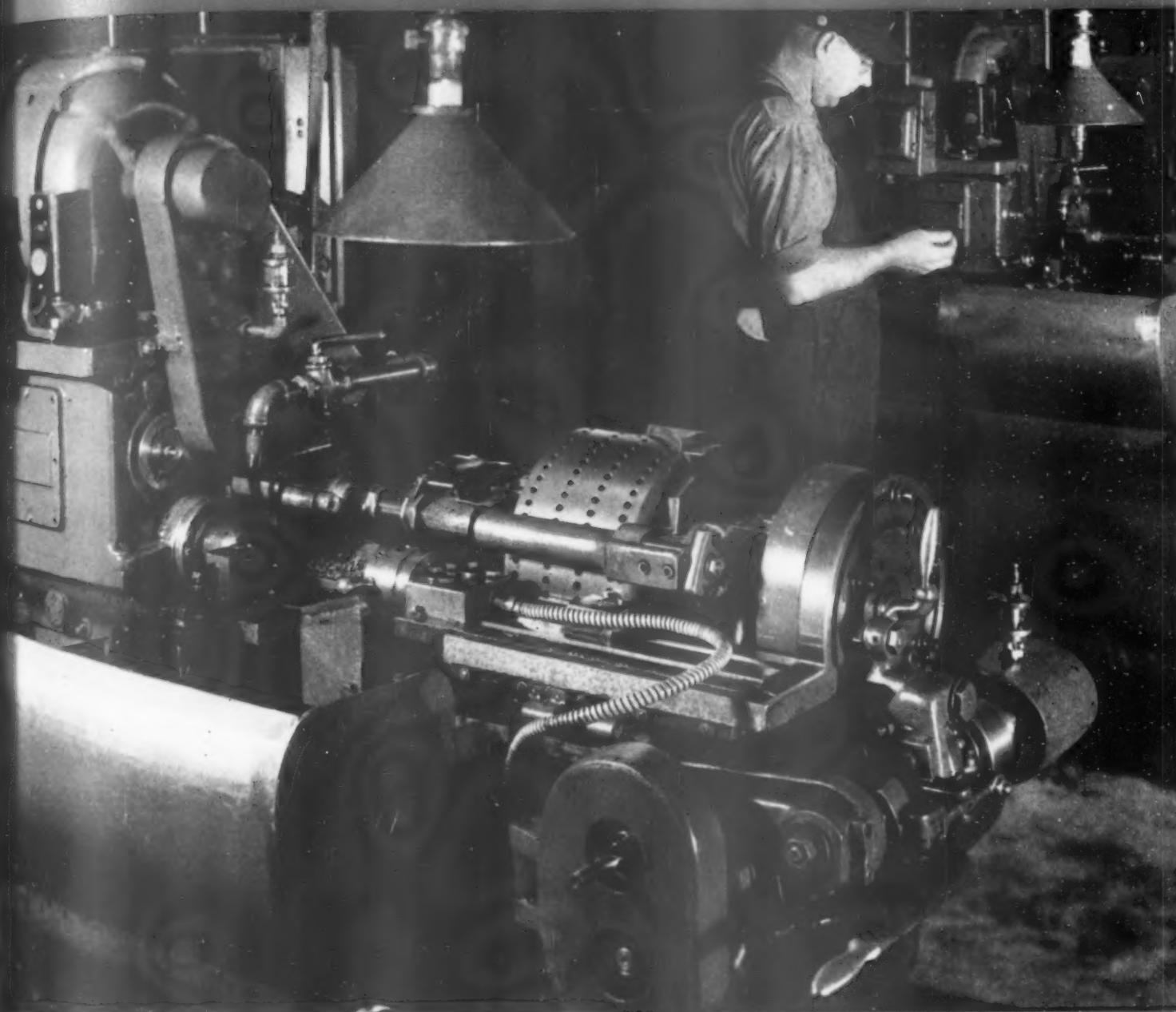
Figure 3. Results of test showing relation of torque to diameter.

In summarizing the discussion thus far, then, it can be seen that Power is affected by size of thread and the T.P.I. There can be no control of power of these two elements of design because they are specified by the user of the taps. It is interesting to note that there is a mathematical relationship between each of these elements of design and power. Therefore it must be realized at the start that a  $\frac{3}{8}$ -24 tap will cut with less power than a  $\frac{1}{2}$ -24 tap. It can also be seen that a  $\frac{3}{8}$ -24 tap cuts with less power than a  $\frac{3}{8}$ -16 tap.

The elements of design which can be controlled are: number of flutes, degree of hook on the cutting face, chamfer design, degree of spiral on the flute, etc. Space does not permit discussion on all these, but it might

(Continued on page 102)

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be well to cover a point which seems to bring about much popular discussion and on which there is definite established information available. This involves the question of number of flutes which are best suited for small taps. By small taps is meant taps which are  $\frac{3}{8}$ " or smaller in diameter.

A test was carried out in which four and three flute taps were compared. Since the test was made on a self-recording dynamometer, the graphs which were made by the dynamom-

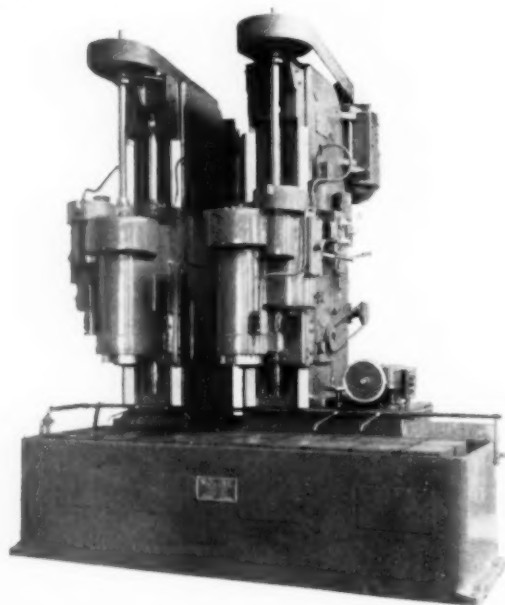
eter are reproduced in Figure 5. The abscissa represents the tap-travel into the hole and the ordinate represents the power developed in tapping.

The first graph represents the breaking load of the three fluted tap which was obtained by tapping into the bottom of a blind hole thus causing it to break. The second represents the breaking load of a four fluted tap. A comparison of the two shows that the three fluted tap is the stronger one. The second part of this work was

carried out to determine the tapping power of these two taps in SAE 4150. It was found that the four fluted tap would break in the hole. However, the tapping operation was carried out successfully when a three fluted tap was used. The tapping power of this tap is shown in graph three of the Figure. It can be seen that this power is very much lower than the breaking load of the tap. Thus it may be deduced that the "safety factor" of a three fluted tap is greater than that of a four fluted tap. The fourth graph represents the power as developed by a two flute tap. It is obvious that it is the best tap to use because it cuts with minimum power.

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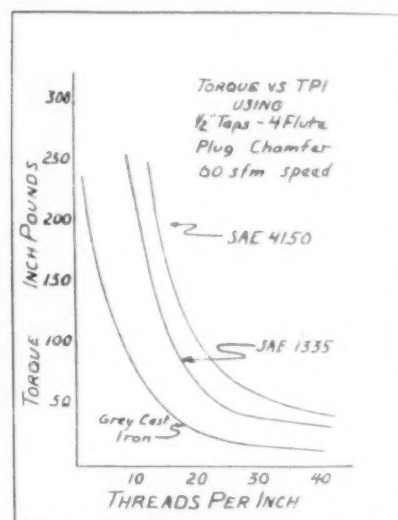


Figure 4. Relation of Torque to TPI.

These graphs show briefly the effect of flutes. However, a great deal of proof has been gathered which shows that the fewer number of flutes that can be used on small taps, the more advantageous it will be. Since they tap with less power, there is less chance for them to break.

The concluding part of this discussion can well be spent in considering tapping speeds. Much attention is always given in setting-up the proper speed at which a tap should be run. So, in order that the previous work be continued it might be well to consider how the three and four fluted taps work under varying conditions of speed.

The results of such work are shown in Figure 6. The tests, carried out under commercial tapping speed conditions of 150 to 1,800 rpm, show that speed has no effect on tapping power. This can be seen from the fact that

(Continued on page 104)



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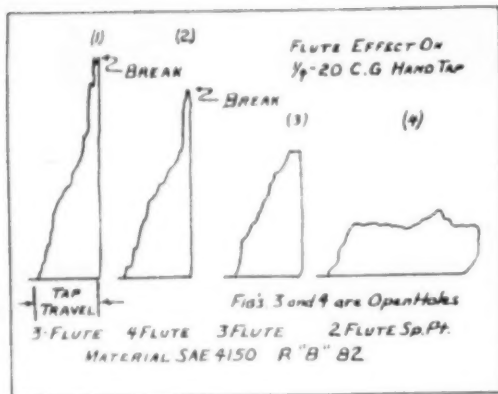
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(Incl. new sizes to be stocked)  
Standard Blanks.....(Stocked)  
(Incl. new sizes and styles to be stocked)  
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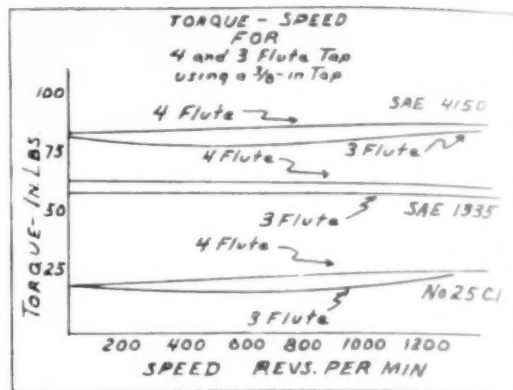
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Left, Figure 5, shows results of tests to determine the number of flutes best suited for small taps. Right, Figure 6, shows the results of tests to determine the proper speed at which a tap should be operated.



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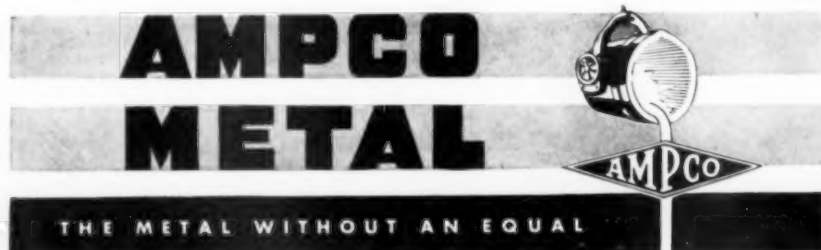
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the graphs are horizontal throughout the entire range of speeds. Further, it can be seen that the three fluted tap cuts with the lowest torque in the three materials on which this test was conducted.

To recommend tapping speeds it can be stated that a tap should run as fast as the conditions under which the tap is working will allow. The speed is dependent upon the type of reversing mechanism on the machine, type of holder for the tap and the manner in which the work is held. Together with this, it is recommended that a continuous stream of lubricant be applied into the hole that is being tapped. Utmost care in aligning the tap with the hole to be tapped should be taken. It is preferred that the tap and work be held rigidly. If these conditions are satisfactory it will be to the tap user's advantage to employ higher speeds because the tap will give a longer production run and produce uniform size holes.

In conclusion it can be said that size of tap and pitch of threads have definite effects on torque required to tap threads and these effects vary in all types of materials even though the graphical characteristics are similar.

It may also be seen that there is definite advantage in using fewer number of flutes in small taps of  $\frac{3}{8}$ " diameter and smaller. The reasons for this are that first, the taps are stronger; second, they cut with less torque; and third, they provide more space for the elimination of chips. Further, the tap should be run at speeds that are as fast as the conditions of tapping will allow because speed has negligible effect on torque.

\* \* \*

Mr. Stromberg has pointed out that his discussion covers only a minute part of the research work on the torque characteristics as they are influenced by the various elements of tap design.

Chrome-plating of tools is finding widespread use. Of particular interest at this time are the time and material saving applications cited by this engineer.

# Chrome Plating



ON broaches, burnishing tools, taps, reamers, spot facers, spinning tools, drill jigs, files, rolls, chuck heads, cams, all types of molds, and a variety of dies, chrome plating shows distinct advantages for many applications.

For example, chrome plated files used on filing machines on hard steels of chrome-vanadium and similar types, will not load.

An outstanding performance is shown on a set of chasers for cutting threads. On hot rolled bar stock, the end is coined for a distance of 1-1/9 inches. Next a 3/8-24 thread is cut for the length of the coining operation. The best that unplated chasers showed was a production of about 300 pieces between grinding dies. Generally the top thread was broken off and ragged. Now with the chrome plated chasers, about 5,000 pieces are secured and a perfect thread is produced. Changing the angle has further increased production to 8,000 pieces.

One firm now plates all production drills. No side wear, burning or welding is reported. When sharpening, all that is required is a slight cut on the edge and the drill is as good as new. About 10 sharpenings on a chromed drill to one on a non-plated one is an estimated comparison. Non-plated, they were usually worn undersize and burned for about one-half inch from the end. This burned part had to be ground away.

A rivet swedging die is used to swedge down four points on the diameter of a 5/16 inch rivet to a depth of approximately .050 to .060. For this purpose they are using a ball shape swedge die which has two 3/32 slots cut at right angles to each other. A plain steel punch will run 3000 pieces,

**Austin Fletcher**  
Superintendent of Finishing,  
The Brewer Titchener Corp.

When chromed they run 24,000 pieces. Reaming two .998 - .999 holes in line, in 1010 steel about 1/32 of metal is removed. This amount of metal, which is excessive for reaming,

has to be left because of forming difficulties in bringing the holes in line. The job is really left to the reaming operation, and causes considerable side strain, due to the reamer cutting more on one side than it does on the other. This soft steel naturally has a tendency to load the reamer, causing the holes to be oversize and ragged.

## Physical Properties of Chromium

Chromium is one of the hardest substances known. In Mohs' scale it is rated at nine with the diamond at 10. The Brinell hardness of electroplated coating is said to range between 500 and 900, depending upon the method of deposition. Its remarkable smoothness makes it unusually suitable in applications where parts in frictional contact will benefit from prolonged life.

On a comparative scale of static friction of surfaces, the following rates are found:

Babbitt on babbitt .....	100%
Steel on steel .....	55%
Steel on babbitt .....	44%
Steel on chrome plated steel .....	29%

Chromium never corrodes, but it is seriously attacked by hydrochloric acid and to a lesser extent by concentrated sulphuric acid. It is unaffected by other acids, and by alkalis or the action of organic sulphur compounds, except at extreme temperatures. Chromium resists oxidation to a temperature of 1150° F. and physical breakdown to 2500° F. Its melting point is 2939° F.

Many liquids including water, and even molten metals, do not readily wet a chrome surface. A somewhat similar effect may be observed when a chrome plated surface comes in contact with metals or other solids. For instance, chips literally fly away from a chrome plated rotary file; there is no loading of the teeth. A chrome plated surface has very little tendency to seize, gall or cold weld to the surface of another metal when the two are rubbed together under pressure. This non-galling property is of value when dealing with the chip bearing surface of a cutting tool and the wearing surface of a forming tool.

Chromium, while hard, is brittle and has little tensile strength. Consequently, on applications where high surface pressures are encountered, the base metal must be hard enough to give the chromium good support, for if the base metal deforms, the chromium will break.



Ordinary steel reamers will run 5,000 pieces, and then the reamer becomes undersized. At one time they were discarded. Then, the company decided to try chrome plating the undersized reamers. Now they are producing a hole up to size and the production runs 7,500 pieces with each coating. Also these plated reamers do not load up, and thus do not score the hole. As soon as they get near the low limits the tools are stripped and replated. On this basis, reamers will run indefinitely.

However, chrome plating the reamer did not conquer one difficulty. A burr was still found on the edge of the hole. A 1-3/16 counterbore mounted on a pilot was used to remove it. A plain steel tool ran 2,000 pieces. Chrome plated tools run 4,000 pieces.

This same firm is broaching the teeth on a brake lever sector which engages the pawl on the brake lever proper. The material is 10-20-1025 steel which makes it more difficult to cut than the average hot rolled steel.

By chrome plating this broach, the number of pieces per grind is materially increased. Plating also decreases chip loading.

A characteristic of burnishing bars and burnishing broaches which are forced, often under high pressure, against a metal surface which must be displaced without being cut, is to become scored and so rendered useless. Chromium has the property of resisting this scoring when in contact with metals. A chromium surfaced tool slides freely over the metal to be burnished and produces a finer finish, does the job more rapidly and does not gall.

A good example of what a burnishing broach can do is shown in expanding the .049 inch wall of seamless steel tubing, 9.265 inches long. It is broached from .887 to .893 for 7 1/4" of its length, and from .893 to .910 for 1 3/4" long. No metal is removed. It is just expanded.

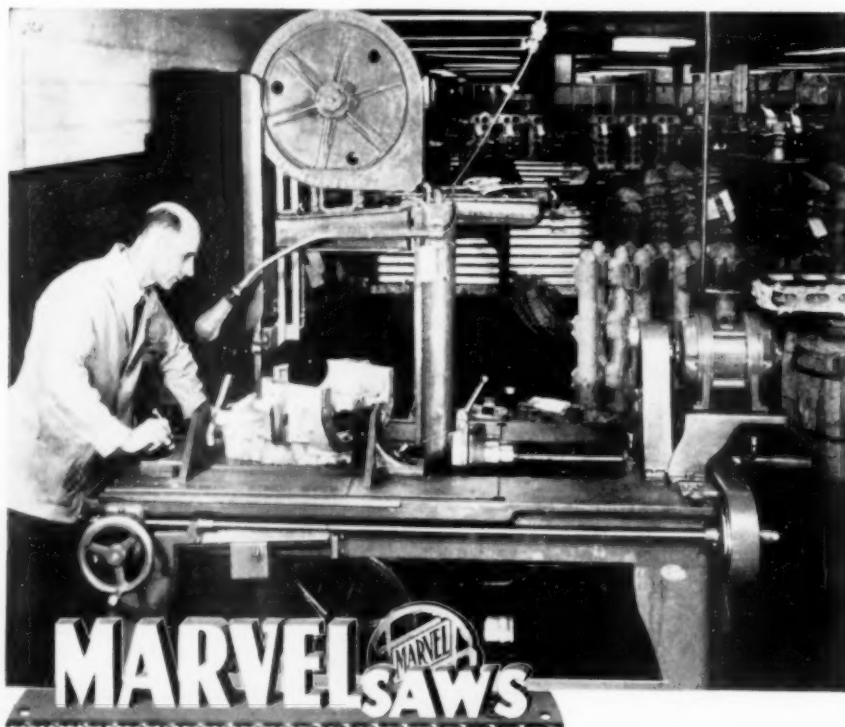
#### Plain Steel Broaches

The average life of a plain steel broach on such a job may be as short as five minutes, depending upon the quality of the steel in the tube. The third piece usually shows scoring. On a fairly decent grade steel a broach may produce about 200 pieces after which the broach is undersize. The average life on all grades of steel, with a chrome plated broach is 4,500 pieces per plating job.

On a 5/16 inch cored hole in a casting which has a carbon content of 3.6% and silica content of 2.4%, a 15/32 hole is drilled and a 3/16 area is milled around the hole at the same time, with a combination drill and milling cutter. After this operation a combination reamer, counterbore, and milling cutter reams the hole to .480, counterbores .002 and face mills the 3/16 area. The .480 hole is tapped with a 9/16-12 tool. On this high carbon casting, the tools were soon built up because of overloading, especially the .480 reamer end and the taps. After running 75 pieces an oversized reamed and tapped hole resulted. After chrome plating, no difficulty was experienced on the reaming and this tap when taken off the operation had produced 5,375 pieces.

On chrome plated welding fixtures the molten spelter does not stick as readily as it does on plain steel, evi-

(Continued on page 108)



Photograph courtesy Packard Motor Car Co.

### A MARVEL No. 8 Speeds All-out Production of Packard Rolls-Royce Aircraft Engines

MARVEL Sawing Machines are playing an important part in speeding production for National Defense. Not only the MARVEL 6A and 9A High-Speed Production Saws that automatically cut-off rifle barrels, gears and parts from bar stock in great quantities; or the giant MARVEL No. 18 Hydraulic Saw so well known for its cutting Speed; but all other MARVEL Saws, too, each in its own way, are at work in America's "all-out production." Take for example, the MARVEL No. 8 Universal Band Saw illustrated above, working on aircraft engine crankcases in the "D" Division of the new Packard Rolls-Royce Engine Plant.

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dently due to chromium's high melting point and the non-wetting characteristics.

Arc welding fixtures, as men with experience along these lines well know, take an awful beating. The spelter must be constantly removed by chipping and scraping, and at best the life is very short. While chrome plating does not cure all the evils, the spelter that does stick cleans off more readily and consequently increases the life of the fixture from two to three times and, of course, will speed up production.

One of the oldest and best known industrial applications for chromium plating is the surfacing of gages. With proper technique in the tool room and plating room, chromium plated gage life is often limited today only by the life of the gaging operation for which it is designed.

#### Dies

On several classes of dies the use of chromium plating is widespread. It has been applied with good results on molding dies for forming plastics such as bakelite or rubber, molds for

forming glass articles, and dies and mandrels used in drawing seamless tubing. Indeed, practically all non-ferrous seamless tubing now manufactured is drawn with chromium plated dies and mandrels. The advantages are increased life of the tools, reduced tool maintenance expense, improved finish of the product, and, in the case of plastic dies, less sticking of the product to the die.

One company which does press work on stainless steel has chrome plated all dies for this work for the past five years. On a high speed press, with a five station progressive die they extrude .032 stainless one inch wide into a ferrule which, when finished, is one-half inch diameter at the base with a 5/16 inch hole extruded to a depth of 3/8 inch. When this job was first tried with steel dies, the dies would pull out and heat up. After 25 pieces were produced, the punches would be ruined. The latest count from this die with the original chrome plating shows a production of 260,000 pieces.

A clinching die used for assembling a 5/16-18 nut into a retainer, caused considerable trouble. The prongs cut into the curling radius on the die, making them upset and deform. Maximum production of the unplated die was 5000 pieces. After chrome plating, production jumped to 100,000 pieces.

In stamping .093 stock, the first operation uses a combination blank and draw die. The blank size of 4 3/4 inches is drawn to a depth of a 1 3/4" by 2 7/8" wide. The second draw produces a depth of about two inches and a width of two inches. The third draw is 2 1/8 inches deep and 1.780 inches wide. The production before plating

(Continued on page 110)



On several classes of dies the use of chromium is now widespread. Improved finish of product is one advantage.



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# Suggestions for

## MORE EFFECTIVE

### INSPECTION PRACTICE

1 Establish a definite wear allowance for all fixed size gages, plugs, rings, etc.

2 Check these gages periodically to determine when wear has eliminated this allowance.

3 In final inspection it is better to use an instrument than a fixed size gage when the wear allowance of the gage by the 5-10% rule is established at .0001" or less. Here the human factor is usually important enough to outweigh the effect of the wear allowance and gaging results become questionable.

4 It is ordinarily not best to use a conventional snap gage for the inspection of work having a manufacturing tolerance of .002" or less.

5 Keep plugs and rings oiled when not in use.

6 Be sure that both work and gage are clean before they are brought together.

7 Periodically check your precision gage blocks for wear, against a set of certified blocks. Redesignate them when wear is revealed.

8 In setting a comparator gage be sure that both gage and precision blocks are at the same temperature.

9 It is well to check the calibration of indicating type comparators periodically. If an error is found, it is better to send the comparator back to the factory for recalibration.

10 If you are using Multicheck gages insist on the operators handling them smoothly. Work should never be jammed violently into gaging position.

#### Sheffield Engineers

*are authorities on precision inspection.  
Get their advice on questions relative  
to gaging and Dimensional Control.*



with a combination blank and first draw was 600 to 700 per hour. After plating this production jumped to 2,000 per hour. On the second and third draw production was 300 per hour before plating and 7,000 per hour after plating.

A variety of stainless spool heads which are used for feeding wool, silk and rayon require a smooth edge. After these spools are blanked out they are formed into a cup. The edges from the blanking operation are turned up on a radius die and formed back on

themselves to within  $3/16"$ . A production of 200 pieces would practically ruin an unplated die. Now, after a run of 11,000 the edges are still smooth.

#### Machine & Equipment Parts

Successful results from the application of chromium plating have been reported after a survey of parts ranging from tiny knitting needles to rolls weighing 15 tons or more. The chromium serves a number of different purposes. Primarily it protects against wear and corrosion; particularly

against corrosion by unusual conditions. In general, it is not considered that chromium plating directly upon steel is a very good protection against ordinary rusting. But for resisting the corrosion due to such things as hot vapors and gases, hot metals and certain highly corrosive chemicals, chromium has been uniquely successful.

For instance, in combating the corrosion caused by impurities in hydrocarbon oil cracking operations chromium plating offered one of the few successful methods of protecting the surface of the chambers. Another application has been made in protecting dies used in zinc die casting opera-



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gage blocks by Dearborn are chosen by men who recognize their superiority as longer wearing standards.



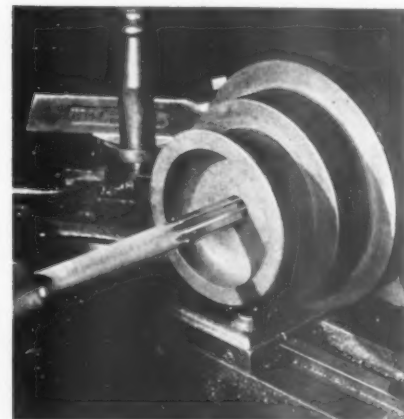
**DEARBORN GAGE COMPANY**

*Originators of Chromium Plated Gage Blocks*

22037 BEECH STREET • • • DEARBORN, MICH.



On gages, as above, and reamers below, chrome plating has increased tool life.



tions, and the safeguarding paper making machinery against corrosion by sulphite liquors.

The wearing qualities of chromium are quite generally considered in connection with bearing surfaces. Other parts, in actual production now being chromium plated as original machine equipment are automotive pump shafts, valve stems, spring shackle bearings and king pins; in the airplane industry, propellers, oleo pistons, propeller shafts, governor parts, camshafts and connecting rods. On non-automotive machinery some manufacturers now provide as stand-

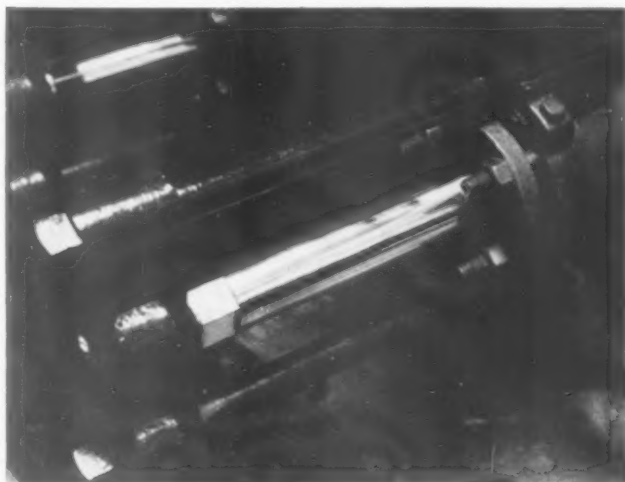
### Advantages of Chrome-plated Applications Compared to Unplated Parts

Part	Unplated	Chrome-plated
Steel keys for 100% inspection on die case automobile locks.	Two hours testing	143,000 tests
Coining die for making horn projectors.	One minute to one week	700,000 parts
Steel plug gage.	9,970 checks	48,924 checks with less than .0002 wear
Steel die for swedging three wires for eye glass frames.	Ran four hours, after which it was necessary to polish and re-set die	52 hours
Test tap running in Bakelite.	1,000 holes	3,000 holes
Spline quenching plug, used for hardening gears. About three inches long and 2 1/2 inches wide, with nubs sticking up, is inserted into the gear while work is red hot. Work is immersed in oil until cool. Plug is then forced out under pressure.	25 pieces	4,200 pieces
Combination blank and draw die for manufacturing ignition lock caps of stainless steel.	1,500 pieces	.0005 chrome plate produced 20,000 pieces—and still going.

ard equipment chromium plated lead and feed screws, drill spindles, reciprocating pump shafts, pneumatic tool cylinders and outboard motor cylinders, and non-machine parts such as expansion joints.

In the previously mentioned applications, the long wearing qualities of chromium are generally desired. How-

ever, in several places chromium shows other interesting results—for instance, the shafts on all reciprocating pumps used by one of the largest manufacturing companies in this country are being chromium plated. Reported advantages are increased packing life, decrease in operating power, increased shaft life.



Some manufacturers now supply as standard equipment chromium plated machine and engine parts such as the pump piston pictured.

Chromium is used in machine shops in reclaiming parts that have been worn or accidentally machined under-size. There are few methods by which metal, which has once been taken off a surface, can be replaced satisfactorily. Generally metal for re-surfacing does not wear as well as the original. However, chromium usually will give a surface as good or better at less than the cost of a new part. Parts that can be reclaimed range from small roller bearings to large Diesel engine crankshafts and include such delicate work as multi-bearing camshafts and precision built machine tool drive shafts.

Hard chrome plating requires careful attention to details, and successful operation depends on a thorough understanding of the principles involved. Special racks are often necessary to insure uniform distribution of the deposit on complicated shapes.

#### The Steps in Plating Dies

1. Pack properly, that is so the die is firmly held.
2. Clean thoroughly in cleaner solution.
3. Rinse in cold water.
4. Acid dip, till rust or scale is off.
5. Rinse in cold water.
6. Brush with Pumice Stone, so that when rinsed in cold water there are no water breaks.
7. Rinse thoroughly.
8. Let stand in hot water till die becomes hot.
9. Rinse in chrome solution for 1 minute.
10. Plate in chrome solution, starting with enough amperage so that the solution will work. Gradually work amperage to the desired amperage. Plate dies at 4 Amps. per square inch.
11. After plated, rinse in hot water thoroughly till die becomes hot.
12. Heat treat in oven at 300° F. for one or two hours.



**What Are the Five Basic Metal Processing Operations in Manufacture on a Mass Production Basis? This Primer Supplies the Answer and Defines the Operations.**



# Manufacturing Operations

**Floyd Eaton**  
Training Within Industry  
Branch, War Manpower  
Commission

**W**ELL known is the fact that the manufacture of most metal goods or parts is facilitated by these basic machining operations: drilling, milling, turning, planing and grinding. Practically the only exception to this rule embraces metal parts which are used in the same finished state as they are cast or molded.

However, except for a few plastic and diecast products, this case is so remote in the manufacture of quality goods on a mass production basis, its consideration in Tool Engineering is seldom required.

It would be uncommon for any machine-section or part to require all of these basic operations, but such cases do exist. Many parts require more than one of the same operation. This condition necessitates a plan of operations for each part. The procedure is a function of Tool Engineering and it is usually termed "Production Planning" or "Operation Lay-Out".

## **SIMILAR WORK**

There are many more manufacturing operations involved, some of which are basically similar to those mentioned. However, the method of performing some of these operations complicates the theory and no attempt will be made here to define the exact status of these operations in a relative sense. For instance, reaming, countersinking and counterboring are basically similar to drilling and are similarly performed. Honing and lapping are similar to grinding although differently performed. Boring and facing when performed on a lathe or screw machine are closely related to turning, but when performed on a drill press they are related to drilling.

Milling, hobbing and gear cutting are similar operations. Planing, shaping, broaching, gear shaping and slotting are basically similar so far as tool action upon the work is concerned.

## **BASIC OPERATIONS**

These five basic operations are further defined here for the benefit of those who have not had extensive shop training.

Drilling constitutes machining a circular hole in a piece of material or work which is less hard than the drill by either of the two following methods: (1) By feeding the revolving drill into the work material at a certain rate of speed and feed depending upon the material being worked. (2) By feeding the drill, held stationary, into the revolving work as done on a lathe or screw machine at a certain rate of penetration depending upon the speed of the work material and its physical characteristics.

Milling is the process of removing excess material by means of a rotary cutter into which the work or material being processed is fed at a certain rate of feed per revolution of the cutter.

Turning constitutes machining the diameter or end surface of revolving work material by bringing a stationary single pointed hardened tool against the work end or outside periphery feeding the same to the proper depth and then taking a cut, longitudinally or crosswise. The rate of feed per revolution is determined by the material, equipment facility and the finish desired.

Planing is the machining of a work surface or contour on a planer by passing the work back and forth beneath the cutting tool which is held stationary in the longitudinal plane.

The feed of the tool across the work surface is mechanically actuated at the end of each stroke. Its amount is regulated by the size, shape and physical characteristics of the material in question as well as the finish desired. Shaping work on a shaper differs basically from planing only in the respect that the action is reversed in that the cutting tool is driven longitudinally over the work, while on planing the work is driven longitudinally beneath the tool (except in special cases) which is held stationary. In each case the cutting action of the tool is identical in principle.

Grinding is an abrasive process whereby excess material is removed by contacting the work with a revolving grinding wheel. The purpose may be for smoothing, polishing, sizing or sharpening. It is one of industry's most important machining operations and is performed in most every shop for a multitude of operations. Grinding is the most practical method of machining hardened work. Advantages of grinding are speed, accuracy and good surface finish.

## **OTHER OPERATIONS**

There are many other types of machining operations which evolve about these five and defining them would not only carry the subject from our avowed purpose Tool Engineering but it would need so much space that it would require a volume itself.

Another important consideration in connection with these operations is knowing when and how to make the most efficient and economical use of them. For instance, it may prove cheaper to surface grind a considerable amount from a work-part rather than milling due to the small amount of tool cost involved as a magnetic chuck (standard on a surface grinder) will often hold the work better than an expensive milling fixture. Often, drilling and similar operations may be more efficiently performed on a hand screw machine for which standard tools and attachments are quite versatile in their application. Hollow milling done on a drill press may replace a difficult turning operation due to projections on a work-part. The field of operations application is legion and the ability of the modern aggressive Tool Engineer will be continually taxed in obtaining economical manufacturing.

# The Battle Of Production

O. W. WINTER  
PRESIDENT, A.S.T.E.



ON thousands of shop fronts, there are being waged and won today countless battles of production. Some, although they may be only skirmishes, are nevertheless tactically vital. Sometimes the public hears about battles won, of successful attacks and counterattacks; too often, these successes go unheralded and unsung.

It is generally conceded that these production victories are winning for us the campaign of manufacturing. The problem now seems to be more one of transportation and raw material supply. We daily hear the praises sung of the "defense workers," the privates and corporals in the line. What do we know, though, of the lieutenants, the captains, the majors and colonels? These men—the tool designers, the Tool Engineers, shop managers and executives—are not only making tremendous sacrifices in time and energy, but are performing virtual miracles of manufacturing.

## ACCOMPLISHMENTS

We read, in a recent issue of "TIME" magazine, a partial report of the Automotive Council for War Production, which cites such tremendous accomplishments in the automotive industry as "undertaking to build 75% of all the aircraft engines," "over 33% of the machine guns," "40% of the tanks, besides all the motorized units."

The article goes on to say, "The industry is working three shifts a day on war orders totaling \$14,000,000,000. In terms of pleasure cars and trucks, that would mean 15,000,000 units—three years' peacetime production."

"It is cutting costs and saving time all along the line thru mass production short cuts; a parts plant lopped 25% off the time Army Ordnance thought it would take to make machine guns; an automaker cut the time scheduled for a British ack-ack gun by four months and evolved a new way of broaching the barrel that cut that operation from three and one-half hours to fifteen minutes; another

An important phase of the struggle for total victory is centered on the production front. America handed the direction of that battle to its engineers and it is now being won in thousands of shops throughout the country.

parts maker improvised machine-gun equipment that beats regular arsenal machinery by twenty to thirty times; an automatic cannon that cost \$1200 to make eighteen months ago now costs around \$600."

We could fill this entire magazine for the next several years with such recordings of accomplishment. While Detroit, with its dramatic and dynamic way of doing things, has to some extent captured the spotlight in its automotive industry conversion, let us not lose sight of the fact that there has been, in most every industrial center in the country, performance of the same quality.

While Tool Engineering and the A.S.T.E. had their birth in Detroit, over fifty-four Chapters and nearly eleven thousand members attest to the fact that Tool Engineering is now nationwide. The accomplishments in

Detroit are typical. Watch this magazine for news of more from all over the country.

It is also significant that many men are showing they are made of the same stuff heroes are made of by a heroic effort in helping and working at defense training and various other A.S.T.E. activities directly related to the war effort. Some people marvel at such individuals; they are living proof of "when you want something done, give it to a busy man to do."

When we got into the scrap, we knew we were good; we still know it, but it remains to be proven, however, in many instances. The cry has been raised "Give us the Tools!"

Well, you're getting them and it's only the beginning. Why? Because the U.S.A. is the greatest production nation in history. Because of our unsung heroes—the Tool Engineers.

## OBSOLESCENCE

▲ Obsolescence of machinery and tools is a constant problem that confronts all progressive manufacturing plants. Tool Engineers, accountants, tax specialists and financial officials alike are concerned with the problems it offers. Obsolescence is such a serious problem financially that it must be recognized if a concern expects to avoid financial difficulties.

▲ Any organization must establish records in such a way that concrete information will be available covering conditions as they actually are, so that a better basis can be presented for the elimination of losses brought about by obsolescence. Such a procedure is not as difficult as it may seem. It merely requires the co-ordination of the Tool Engineer and cost accountant so that records of the desired nature would show the actual value of equipment under consideration. On this basis, much thought must be given to obsolete equipment.

▲ Obsolescence is the deadline beyond which a machine or tool can compete profitably with something better. None of its value is destroyed until the deadline is reached, then the value is destroyed all at once. Depreciation approaches the deadline gradually by constantly diminishing value. The two should not be confused.



## WASHINGTON LETTER

By A. N. WECKSLER

Washington Correspondent for  
THE TOOL ENGINEER

Plant and power facilities adequate — material shortage key to WPB actions.



**K** EY to War Production Board actions during the latter months of this year is shortage of materials. There appears no shortage of plant facilities, and power will probably be adequate through 1942.

In addition to the material shortage, the labor problem is becoming increasingly a matter for immediate concern. The rate of induction of men into the armed forces will increase rather than level off. Large scale hirings of women will become necessary the latter part of this year.

While there has been some discussion of power shortage, a real shortage will not develop this year, and possibly shortages will not really become acute until some time in 1943.

### The Power Supply

War Production Board power officials indicate that adequate rainfall has guaranteed an ample supply of hydro-electric power. Problem now centers in some of the steam plant power areas, where power producing facilities are being taxed. In some areas of the Southwest, the drain on power by defense industry has cut into the so-called "net assured capacity". A breakdown of equipment would leave the area short of power for the period of time required to effect a repair.

Such breakdowns would not mean

curtailment of industry. It would be more likely that civilian uses would be cut until the deficit in power was made up through repair.

On the other hand, possible curtailment in operations due to shortage of materials is a real threat.

### Materials and Plant Capacity

Chairman Nelson, in his announcement of "realignment" of WPB, pointed out that some plants might not be able to obtain sufficient materials to run at full capacity. The Production Board official stated that it may become necessary to designate certain plants as those which can run at full capacity.

Study is now being made of the minimum requirements to maintain the civilian economy. From this study will develop an "order of urgency" for industry, so that when material, labor, transportation or power shortages develop, minimum quotas of civilian items can be produced.

### Further Subcontracting

Obviously, shortage of materials rules out further expansion of any but the most important plants. Synthetic rubber and high octane gasoline plants will be completed, but other projects will be reviewed, and delayed if there is no urgent need for their output.

This construction curtailment was

first indicated several months ago, but it is just beginning to become effective.

A further effort will be made at subcontracting through the Smaller War Plants Corporation. This Corporation was set up within the War Production Board under a Congressional act providing for a \$150,000,000 fund. The money is to be made available to finance smaller plants to undertake war contracts.

Lou Holland, who has been made the director of the unit, will seek to encourage subcontracting through pooling of facilities, where practicable. Holland, who organized a subcontracting pool in the middle west, indicates that small plants will be able to obtain materials for a subcontract, provided they are efficient producers.

### Help for Smaller Plants

Holland claims that previous efforts at subcontracting failed because smaller plants were not given technical aid in gearing them to war work. He plans to organize a corps of engineers who will have the "know how" of conversion, and who can go out into small plants and show managers and foremen how to work on the close tolerances required on Government contracts.

If the plant requires financial assistance, the Corporation will advance the necessary funds. If the plant, or a pool



# PRODUCTION FLASH

UP-TO-THE MINUTE NEWS ON A NEW DEVELOPMENT IN WHEEL-DRESSING!

---

3200 W. DAVISON  
DETROIT, MICH.

Down-time on metal cutting machines, a cause of much delay in producing urgently-needed war materials, has been drastically reduced in many plants by the introduction of a new type of diamond tool for wheel dressing operations.

On a centerless grinder grinding shot form, production between dressings was INCREASED 100% over the former method of dressing. On many other grinders the down-time has been reduced from hours to minutes; including cylindrical and centerless grinding operations whether the wheel form be straight or profile and step form; also on gear grinding for either straight or involute sides and on large surface grinders.

The unusual feature of the tool is that, once positioned to the wheel it stays in position until the diamonds are completely used up. No changing, turning or re-setting is necessary; the operator doesn't touch the tool again after it is set up. Dresser wear is slow and uniform and fewer passes are required to dress the wheel. Thus, a uniform finish on the wheel is attained and a more uniform finish on the work results. The fact that the tool leaves a free-cutting wheel makes possible more work between dressings.

Secret of the tool's outstanding performance is the precise relationship between the diamond size and the grain of the cutting wheel. Each

(over)

tool must be engineered to the particular job and to the wheel on which it is to perform. In most cases this is a simple matter, the manufacturer of the tool supplying engineering data sheets which, when properly filled out, give all information necessary for building a successful tool.

These revolutionary new tools have been developed, patented and are sold exclusively by the Wheel Trueing Tool Company, Detroit. They are known as Tru-Line Tools. Write to Wheel Trueing Tool Company, 3200 West Davison Ave., Detroit, Michigan, for complete information on Tru-Line Tools and for Tru-Line Engineering Data Sheets.



# *Tools to Victory!*

Worn tools, laying around under work benches, in the corner of the shop or in the scrap pile ought to be fighting for you, fighting for more production, fighting to produce more vital war equipment, and incidentally, save money for you.

We can help to put them into active service of the production forces of Uncle Sam's War Effort.

Worn Tools are vitally needed to Win this War of Wars.

## *Don't Scrap a Tool! Scrap a Jap!*

### **A COMPLETE RECONDITIONING SERVICE FOR TOOLS**



EASTERN CUTTER SALVAGE CORPORATION, 30-32 LITTLETON AVE., NEWARK, N. J.

Western Plant • MASTER TOOL CO., INC., 5605 HERMAN AVE., N. W., CLEVELAND, OHIO

Chrome Plant • MASTER CHROME SERVICE, INC., 5709 HERMAN AVE., N. W., CLEVELAND, OHIO





of plants, lacks a specific tool, the Corporation will endeavor to obtain the required tool. Prime contractors will be persuaded to subcontract, and some arrangement will be made so that the small plant can guarantee performance.

Possibly, in some cases, the Corporation will undertake a prime contract, and subcontract among a pool of smaller plants.

It appears that while the rate of subcontracting may be increased, subcontracting will only serve to fill out existing lines of war production. The

smaller war plants will also be encouraged to convert to essential civilian output, but here again the supply of materials will be a major limiting factor.

### WPB Realignment

The War Production Board "realignment" did not clear up some of the major problems involved in war production. The "realignment" was designed to gear WPB to two important functions—policy making on overall war production, and control of materials in regard to both military and civilian production.

It is the contention in some WPB quarters that the Army and Navy Munitions Board is duplicating some of the functions of WPB. Specifically, Chairman Nelson pointed out that in the field of machine tools, WPB would seek to control both the manufacture and distribution of tools. The former system of tool distribution was not altered, but surveys have been started by WPB to determine the machine tool requirements for new plant facilities.

These surveys are indicative of the effort to extend controls over machine tools. The Army and Navy Munitions Board, however, is likely to maintain a large measure of control.

War Production Board actions affecting machine tools are as follows:

June 19 — Interpretation 2 to General Preference Order E-1-b clarified the application of priority ratings to deliveries on machine tools. Where tools are listed on the Master Preference List, the order of urgency is determined by the standing on the List, and an emergency rating will not obtain quicker delivery. However, deliveries on tools not subject to Master Preference List control can be expedited through emergency orders. Machine tool orders of certain Canadian purchasers assigned blanket A-1-a rating.

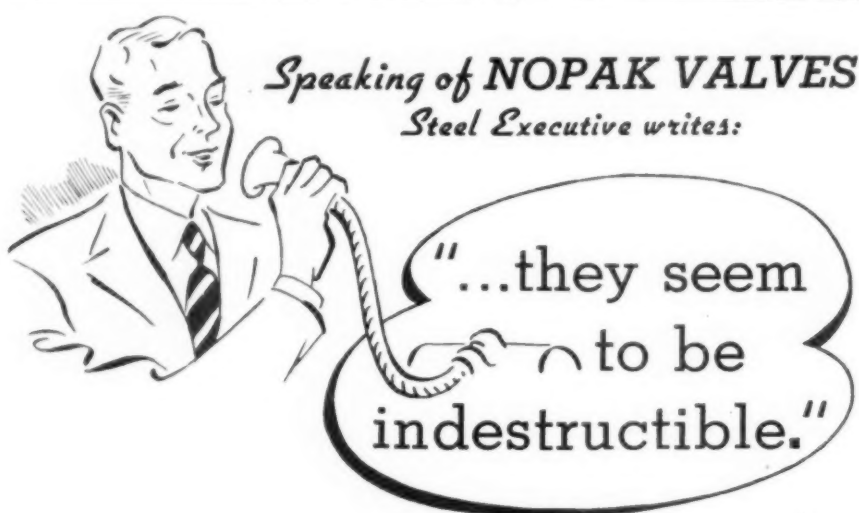
June 23 — Amendment to Vanadium Conservation Order M-23-a extends vanadium use control to metal in inventory, and use of such metal must be authorized by WPB. Amount which can be used per month without restriction was cut from 50 pounds to 10 pounds.

June 26 — Industrial hand files subject to alloy steel restrictions under E-6.

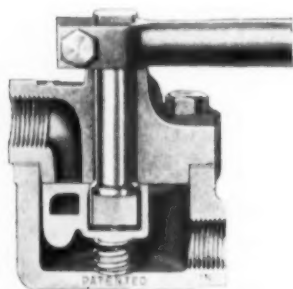
June 26 — WPB announced that the value of new machine tools, presses and other metal working machinery shipped during May was \$118,500,000, a substantial increase over the previous month. It is planned to ease off production when it reaches 1½-billion-dollar-a-year rate.

June 26 — Priorities Regulation No. 12 permits issuance of new top ratings AAA, AA-1, AA-2, etc. The military services will issue the new ratings and will expedite delivery on existing contracts where necessary by re-rating outstanding orders.

June 30 — Amendment to General Preference Order M-29, bringing ore concentrates under coverage of the order. Tungsten is redefined to include any product containing tungsten, with



● In May, 1927, twenty-two NOPAK Valves were installed on air pressure lines in the Worden-Allen Co. plant. On May 1, 1929, the plant superintendent reported: "All valves O.K., will not flicker a match." On July 11, 1931: "... every valve tested and found in perfect shape. No repairs or adjustments of any sort...since original installation."



Cross-Sectional View, NOPAK 3- and 4-Way Valve. Simple design, rugged construction, packless assembly, and the famous NOPAK Bridged-Disc Principle make NOPAK Valves leakproof and wearproof. Perfectly lapped, leakproof sealing surfaces of disc and seat improve with use...are constantly shielded from grit abrasion.

After fifteen years, March 23, 1942, the company's president wrote regarding original installation and subsequent purchases: "... all valves still in service, except where air pipes have been removed... they seem to be indestructible."

Production executives, NOPAK Valves, both shut-off and operating, will deliver the same long-lived, maintenance-free service in your plant. They are built for lifetime protection against air or pressure loss, ease and speed of operation, plus precision control of air or hydraulic power. For detailed information and data, write for Bulletin 84.

GALLAND-HENNING MFG. CO.  
2757 South 31st Street, Milwaukee, Wisconsin

**NOPAK** VALVES and CYLINDERS  
DESIGNED for AIR or HYDRAULIC SERVICE

A 3784-1/21

# ALL-OUT PRODUCTION FOR VICTORY

*Dalzen*

THREAD GRINDERS, TAPS and  
BROACHES are speeding  
up production



Shown above are some of the broaches and taps manufactured by Dalzen. The broaches are made in rounds, flats or form. The taps are Whitworth and British Association form.

43"  
WIDE  
39"  
DEEP  
72"  
HIGH

48" WIDE  
38" DEEP  
75" HIGH



The Dalzen No. 1 Thread Grinder will grind threads up to ten inches in length anywhere on an eighteen inch shaft with a diameter maximum of six inches. The Dalzen No. 2 grinds threads up to four inches in length anywhere on an eight inch shaft with a diameter maximum of three inches.



## Do much more • take less floor

Today two things are of paramount importance in American Industrial Plants: (1) more work, higher speeds and (2) most effective utilization of given floor space. Dalzens meet both requirements and you can use the saved floor space for added equipment or more efficient tool arrangement. Interested in more output in less space?

WRITE FOR BULLETINS

# DALZEN TOOL & MFG. CO.

12255 E. 8 Mile Road

Detroit, Mich.

the exception of alloy steels and finished tools.

July 1 — Small diamond dies, used in drawing wire, placed under allocation control by General Conservation Order M-181.

July 1 — Maximum Price Regulation No. 136 issued, providing new pricing formula for parts and sub-assemblies.

July 1 — Amendment 1 of Limitation Order L-146 alters definition of electrodes and rods to clarify the reporting

procedure for manufacturers, and making it clear that the order applies only to finished rods and electrodes.

July 2 — Chromium order M-18-a extended indefinitely.

July 2 — Supplementary Order M-21-g designed to conserve nickel going into heat resistant steel alloys.

July 4 — Appeals Branch established to handle appeals from the Iron and Steel Conservation Order M-126.

July 7 — Priorities Regulation No. 13 issued; frees large quantities of critical materials which have been frozen in idle inventories. Holders of such inventories are permitted to sell the materials to approved classes of purchasers without any specific authorization from WPB. Objective is to release materials which have been frozen, with the release based on the fact that end uses are already controlled, and that control over the sales is not necessary as long as the material goes into authorized uses. By this regulation, the seller is relieved of responsibility as to use, with the buyer subject to all the use restrictions applicable to the metals involved.

July 7 — WPB Chairman Nelson issued the order effecting the "realignment" of WPB.

July 10 — Acting on machine tool builders' suggestion, WPB bans special design electrical equipment specifications after July 15. L-147 permits the completion of special design electrical equipment already on order. Action taken to speed up tool output.

July 14 — Terms of Preference Order P-73 broadened to permit additional smelters and refiners to obtain repair and operating supplies. Original order permitted smelters and refiners of copper, lead, zinc, antimony, cobalt and nickel to use P-73 ratings. Amendment allows refiners and smelters of iridium, molybdenum, nickel, platinum, tin, tungsten and vanadium to operate under the preference order.

July 17 — Machine tool builders who file under Office of Price Administration Procedure Regulation No. 1 requesting an increase in price permitted to make the increased price effective while their application is pending before the OPA.

#### NEW BOOKS

*Manual of Lathe Operation*, 272 pp., \$1.00, Atlas Press Company, Kalamazoo, Michigan. Containing 366 illustrations and 89 charts and tables, this manual is compiled by the engineering staff of the Atlas Press Company.

Describing the care and operation of modern screw-cutting lathes, the manual contains the latest technical data for machining the new metal alloys and plastics, tool grinding, cutting speeds, and lubricants.

Quick reference is possible through an accurate index and divisional tabs which make each chapter immediately available.

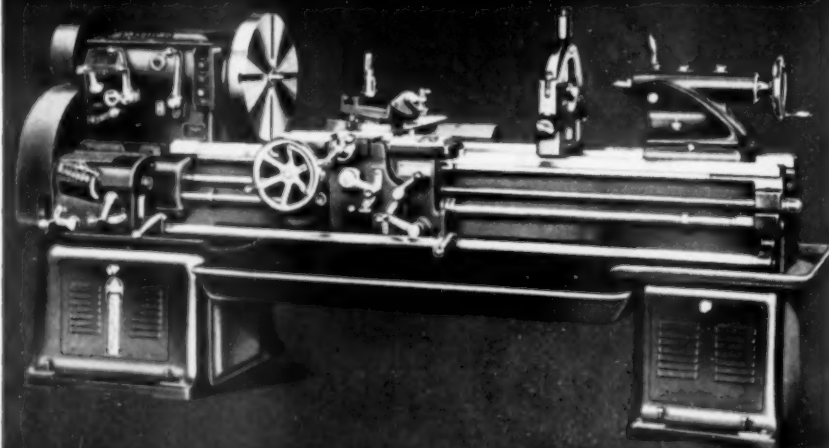
## NO SPRINGING . . . even under the heaviest of cuts!

### BRADFORD Metalmaster LATHE

The bed of this Bradford Metalmaster Lathe is semi-steel containing 50% to 60% steel and has a smooth wearing surface of uniform grain structure. The ways (two Vs and two flats) are carefully planed and hand scraped to close tolerances for the entire length. Deep walls, connected by heavy elliptical cross girths, closely spaced, prevent springing under the heaviest cuts. The lathe is supported by heavy cabinet legs at both head and tail ends, and on long beds, center legs are provided. Chip pans, wet or dry, can be installed before or after leaving the factory.

WRITE FOR FOLDER

## for the Battle of Production



**THE BRADFORD MACHINE TOOL CO., CINCINNATI, OHIO**  
Also Manufacturers of Unit Type Drilling and Tapping Machinery



I SHALL take the privilege of taking very seriously the word "early" in the title of this article, and shall go back as far as it is possible to find any material on the subject.

Man, it has been said, is distinguished from the brute creation by being a tool-using animal. Text books on mechanics enumerate six simple mechanical powers — the incline plane, the lever, the wheel and axle, the pulley, the wedge and screw. Of these devices the inclined plane and the lever are the fundamental ones; the others are but modifications of these two. The pulley and the wheel and axle are forms of the lever, while the wedge and the screw are variants of the inclined plane.

Of these two fundamental mechanical powers the inclined plane was probably known in pre-human times, perhaps ever since the first squirrel found it easier to run up a slanting tree than to climb a straight one. The mechanical advantage of the lever was early recognized by prehistoric man, and these two mechanical devices were all that the ancients had to enhance the muscular power of man or beast down to perhaps 1000 B.C.; and yet with this limited mechanical equipment the ancients managed to accomplish some remarkable pieces of engineering work.

### **Egypt Outstanding**

There is one country which is outstanding in this respect—Egypt. Not only do we find there ancient monuments whose erection required some heavy engineering, but we have also records of the way in which this work was done. Our sources of information on this matter are two-fold. On the walls of the old tombs and temples we find paintings depicting the daily life of the people, the occupations of the craftsmen and the amusements of the leisured class, which the rainless and frostless climate has preserved for us in the brilliancy of the original colors. We also find here and there unfinished pieces of engineering work, in some cases with the tools left by the workmen when for some reason the work was abandoned before completion.

By piecing together these fragments of information we can get a pretty good idea of how these old engineers worked. It was the good fortune of myself and my lady to visit

**History Records Tool-Using as Early as 1,000 B. C. In Egypt is Found the Earliest and Outstanding Examples of the Utilization of the Engineering Principles Upon which Modern Mass-production is Based.**

# Glimpses of Early Mechanics

**Dr. Paul R. Heyl**

Egypt a few years ago. The mechanical aspects of the ancient monuments interested me, and I have since talked with others who have given special study to these matters.

Egypt is a land of stone buildings. Wood is scarce, but large deposits of limestone and granite exist in the upper Nile valley. In these quarries the stone was cut and floated many miles down the river to the place where it was to be used. Two methods were used in cutting the stone. In one of these quarries there was found a broken obelisk and a long copper saw. There is an idea prevalent that the ancients knew of some way of hardening copper which we moderns have never been able to rediscover. This is apparently a myth. In connection with this saw there were found fragments of emery. Mines of emery have been known in the islands of the eastern Mediterranean for thousands of years. Emery ground to a coarse powder, mixed with water and applied with a copper saw and plenty of elbow grease did the trick.

### **Use of Drills**

At another place there was found a row of holes drilled into the rock. This was probably done with emery and a bow drill of bronze or copper. Near this row of holes was a trough, probably intended for holding water. If plugs of dry wood were driven into these holes and then saturated with water, the expansion would crack the rock. This method was used in later times elsewhere in the world, but the idea seems to date back to the ancient Egyptians.

The roughly cut stone was prob-

ably jacked up a few inches at a time with levers. Pulleys, and especially block and tackle, were not known in 2500 B. C. when the pyramids were built. The stone was then smoothed into shape, first by flint chisels and stone hammers, and in the later stages by emery applied by flat stone grinding plates. A picture in one of the old temples shows two workmen testing the flatness of a stone face by stretching a string across it in different directions. There have been found flat stones smeared with rouge, which these old workmen used as a modern mechanic uses a surface plate. The perfection of the work done with these primitive tools is remarkable. Some of the polished stone surfaces in the old tombs, when tested with a straight edge, showed variations from flatness of only one or two hundredth of an inch.

### **The Obelisk**

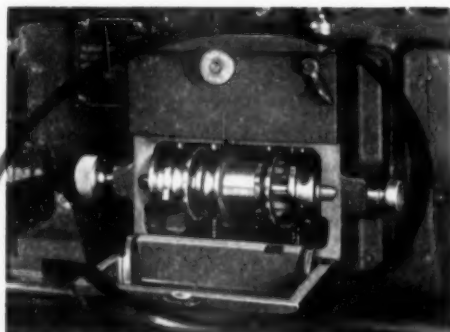
The loading of the finished stone on board a boat for transportation down the Nile was, in some cases, an engineering problem of the first magnitude. Consider the case of an obelisk. These great monoliths weigh from one hundred to two hundred tons. Moreover, stone is brittle, and a long stone of this shape, if not supported carefully in moving, is likely to break of its own weight. In addition, if such a stone should get away from those handling it and fall only a few inches, it would break the bottom out of the boat. It is sometimes said that the construction of these ancient monuments was possible because the ancients had unlimited man power and plenty of time; but considering the problem of moving an obelisk from an engineer's point of view, we can see that something more was necessary. Brains were required, and the evi-

*(Continued on page 131)*



# You Don't Need a Toolmaker

## TO RUN AN O-8 MILLER



*Above:* Boss of the feed cycles. Cycle selectors may be changed in a minute or two.

When you find it difficult to hire toolmakers and first class machine operators, then you appreciate machine tools having that intangible quality "built in skill", coupled with as many automatic features as compatible with your production requirements. These two factors—both of which are prominent in CINCINNATI O-8 Millers—go a long way towards keeping your assembly line running smoothly.

In the illustration above, the operator is milling screw driver slots in small screws. There are only two things for him to do—load the fixture and flip the starting lever (clamping, unclamping, and ejecting are automatic with the movement of the table).

*The machine automatically goes through the cutting cycle, and returns the table to the starting point. The complete cycle requires only .08 minutes, hourly production depending largely upon the dexterity of the operator in loading the fixture.*

This machine is not a single purpose installation—far from it. By merely changing the cycle selector (a matter of a minute or two), almost any conceivable feed cycle can be obtained.

Write for catalog M-828. It contains the complete description and specifications for CINCINNATI No. O-8 Plain Automatic Milling Machines.



*Right:* CINCINNATI No. O-8 Plain Automatic Milling Machine with automatic rise and fall spindle carrier.

THE CINCINNATI MILLING MACHINE CO. CINCINNATI, OHIO, U.S.A.

TOOL ROOM AND MANUFACTURING MILLING MACHINES... SURFACE BROACHING MACHINES... DIE SINKING MACHINES

# PRODUCTION PERSPECTIVES...

News Review of Mass Manufacturing



## Trends

Though the bottleneck in war production has admittedly shifted from machine tools to raw materials and manpower, the men who make the tools that make the guns must lift their sights still higher.

Such is a warning from Lt. General Wm. S. Knudsen. While touring war production plants, the former automotive engineer-executive said, "We are making the greatest number of machine tools any country in the world has ever made, and it's still not enough." Though mass-production minded Knudsen admitted that distribution of materials remains one of the most critical problems, he reminded workers and industrial leaders that "goods produced by us in the next 60 days will be more valuable than twice the amount produced next year."

You can be certain that those charged with the responsibility of directing America's production now understand the nature of this war. This country will not be caught with "too little too late."

## Going Up

The continuing rise of machine tool production is ample proof of fallibility of estimating the nation's total productive capacity. Let's look at the figures.

The value of new machine tools, presses and other metal working machinery built in May amounted to \$118,500,000. If the chips have been flying since Pearl Harbor, they'll fly faster this month. Shipments of machine tools alone in June

amounted to 25,700 units, valued at \$107,300,000. This was a rise over the preceding months of 400 units valued at \$4,000,000.

Though the U. S. machine tool industry admittedly possesses no Aladdin's magic lamp, it certainly possesses a genius for production which will govern the course of world events. Though complete machine tool production figures for World War One are not available, The War Industries Board has estimated that the monthly peak was attained in November 1918, when the total volume reached \$40,000,000—less than one-fourth of last month's production!

Metal working machinery manufacture already has topped a \$1,400,000,000 yearly figure and is steadily rising. Compared with the same period last year, the May value for tool output jumped 80 percent!

## Production

It is doubtful that many Americans today do not understand the term "mass-production". They know that it is the key to total victory and the salvation of the American way of life. In terms of cold cash, the average daily rate of expenditures by the Federal Government for war production purposes rose in June to \$158,600,000. This represented an increase of 6.3 percent over the previous month. Actually, the percent of the total U. S. production devoted to the manufacture of fighting equipment is more significant. In this re-

## "GREENIE"—

## Taking It Literally





spect, the country hit an all-time industrial-index high in July, with already hard-pressed railroads toting an ever-increasing flood of war material toward the battle fronts.

War goods now account for 70 percent of all U. S. durable goods output, and "almost exactly half" of the nation's total production, according to the Federal Reserve Board. Despite mounting production, the WPB expects 24,000 small factories to close their doors before the end of the year—for lack of raw materials and machines directly applicable to the war effort. Last year these shops turned out eight per cent of

the country's total production—\$4,000,000,000 worth.

#### Little Junk Man

Back of all production today is steel, and here the situation has become as critical as machine tools once looked. The millmen make no bones about the fact that every village and city dump, home basement and farm yard, machine shop and foundry must be thoroughly scoured for scrap.

While the steel makers are pushing their mills along at 97 to 99 percent capacity—1,050,962 tons in June—they are keeping one eye peeled for the little junk man with his small pile of scrap.

The immensity of the task faced requires a sharp rise in the tempo of the salvage program. If steel mills are to continue their present pace, the flow of scrap iron and steel must be increased at least 6,000,000 tons—25 percent more than normal.

#### Salvage In Industry

Now clear is the fact that industry's scrap salvaging efforts are better planned, more productive than the civilian program directed by the government. The opportunities for scrap salvage available to Tool Engineers is indicated by the fact that one contractor at work on ordnance reports that it usually takes about three pounds of metal to make one pound of the average gun. The other two pounds go into the chip barrel—if they're carefully collected. This producer reports that when one gun forging starts down the line it weighs 85 pounds. When the last machine tool has touched its surface, it weighs exactly six pounds.

Scrap from such gun forgings is soon on its way back to the steel mills. But scrap salvage on the home front is not so intensive. That the public is becoming aware of the seriousness of the situation, however, is the fact that hundreds of American heroes, enshrined in iron and flanked by rusting cannon in as many village courtyards, are being eyed by increasingly active local salvage campaigners.

#### Conversion

With the production bottleneck shifted from tools to raw materials, more than 250 civilian articles ranging from Grandma's crochet hooks to the ever-popular pari-mutual machines were added last month to the long list of those items whose manufacture is prohibited by the iron and steel conservation order.

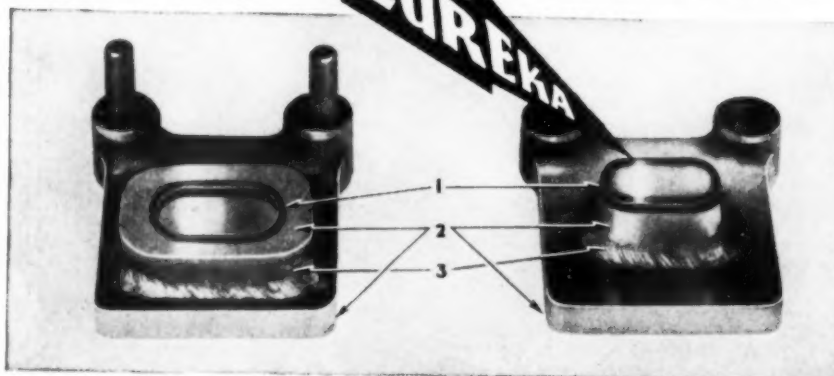
In most instances, producers of these items will swing into war production. And, based on past experience, it won't be long before materiel they produce reaches the firing line. The one-time automobile industry is building more than 300 different kinds of such materiel. This production, one-sixth of the total war work volume, has a daily dollar value of \$12,000,000, and is expected to jump another million or two within a fortnight. Now clear is the over-estimated time required for Tool Engineers to complete factory conversion in the horseless carriage business.

#### Two for One

An equally significant result of the application of Tool Engineering principles is the dropping cost of goods turned out by these same plants. WPB Chief Don Nelson cited this fact during a plant tour when he pointed to the case of a gun that had an original cost of

(Continued on page 126)

## Here's an Opportunity... to CONSERVE TOOL STEEL by using EUREKA ELECTRODES



Yes—it's being done every day. Tons of tool steel and alloys are being saved by welding worn or fractured dies with Eureka Electrodes and the use of a vast amount of like material is being eliminated by welding on the working edges of less expensive and more easily procurable carbon steels.

### HERE'S HOW IT'S DONE

Illustration shows typical fabricated dies. Arrows 1 point out tool steel electrode deposits used as cutting edges, neither of which are over 3/16 inch thick. Arrows 2 indicate machine steel used instead of tool steel to lower die composition cost, and 3 refers to construction welds made of mild steel rod to hold die parts together.

**WELDING EQUIPMENT  
and SUPPLY COMPANY**

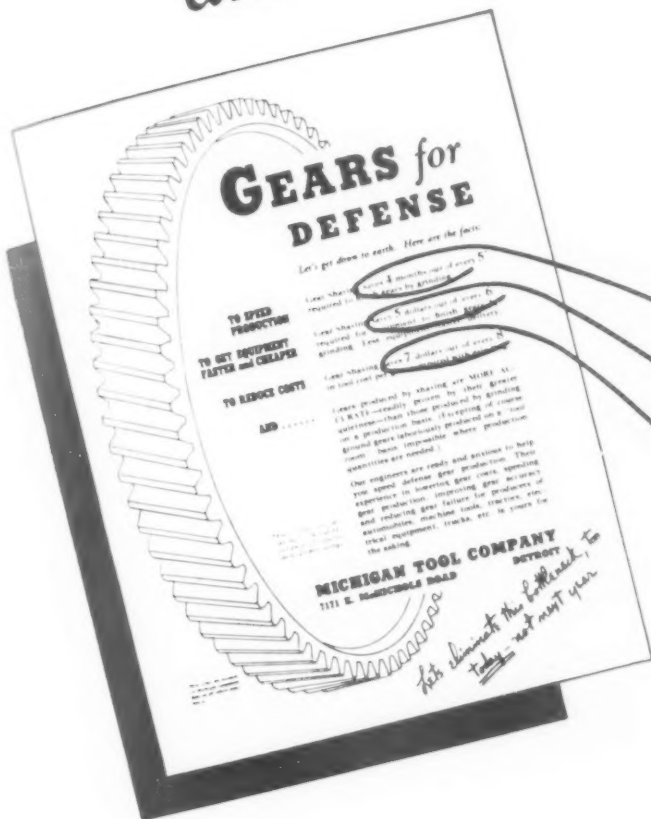
222 LEIB ST.

DETROIT, MICH.

We would like you to have our bulletin which describes and illustrates in detail the application of this new type of electrode. Send for it now!

**AERO GEARS, too**  
**SHAVED\*** ---  
are now

Since the advertisement at left appeared in 1940, there has been widespread adoption of the "Michigan" crossed-axis shaving process for finishing aircraft gears to multiply output and cut costs—while IMPROVING QUALITY.



*Saves 4/5 of the time*

*Saves 5/6 of the equipment cost*

*Saves 7/8 of the tool cost*

\*Most, but not all aircraft gear designs lend themselves to finishing by shaving. We will be glad to advise you whether or not your gear designs permit the use of the "Michigan" gear finishing process.

There are several types of finishers to choose from—rotary and rack—external and internal—for large gears and small gears.



*A battery of "Michigan" rotaries finishing gears in the plant of one aero engine producer.*

*attery of "Michi-  
rotaries finishing  
s in the plant of one  
engine producer.*

**MICHIGAN TOOL  
C O M P A N Y**

7171 E. McNichols Road • Detroit, U. S. A.

\$1,000, and today is being made for less than \$500. Thus, two guns will be delivered at the cost originally estimated for one!

### An Important Tool

When a journalist shoves a clean sheet of paper into his typewriter these days, he's apt to ponder the old saying that "the pen is mightier than the sword." In this man's war the typewriter may not be mightier than the gun, but it's still mighty important. Such is the substance of a government plea for civilians to sell Uncle Sam every writing machine not in daily use. Typewrit-

ers, says a government official, "are an indispensable tool of war".

Every communication, order for battle, report, purchase order—for ammunition, uniforms, food—depends upon the use of a typewriter for legibility. On the battlefronts, the need for typewriters is enormous. A typewriter is an essential on every bomber. Before recent restrictions, each battleship normally carried 59 typewriters, aircraft carriers, 55, cruisers, 30, every destroyer, 7.

Why aren't there typewriters to go around? Conversion again. One such machine requires more steel and man hours in manufacture than a Garrand

Rifle. There were six manufacturers whose volume of business in 1941 amounted to \$85,000,000. Except for the smallest firm in the industry, typewriter production will cease before the close of the year. Included among the products of the industry now are many types of fuses, 30-caliber ammunition, carbines, rifles and 40-mm projectiles.

### Best Yet

With complete or partial conversion taking place in virtually every line of civilian manufacture, it was still somewhat of a surprise to learn that one of the country's best known food producers will soon be in "large-scale" production of plastic plywood airplane and glider parts. Work will be done by no other than 73-year-old H. J. Heinz Co., makers of the famous 57 Varieties. Adamant to discuss the work, the pickle people permitted word to leak out that part of the job would be done on pressure machines formerly used for canning.

### Materials

Without more raw materials, conversion of industry to war work or further expansion of the war production is impossible. As a result of recently disclosed developments, one of the world's lightest and most abundant metals is now available for a multitude of additional uses. That metal is magnesium.

Its use having been previously restricted by the inability of engineers to weld the substance, a newly-discovered method of arc welding is viewed as one of the most significant advancements in the science of welding. The achievement by Northrop Aircraft Inc., engineers who devoted two years to research on the problem, should be especially interesting to readers who have been following THE TOOL ENGINEER's series of articles on modern welding techniques.

### For Primary Construction

As a result of this new welding technique, magnesium can be used as a primary construction material in the wartime aircraft program. One third lighter than aluminum, it may rival that metal and compete with stainless steel. Heretofore, difficulties in fabrication relegated it to use as a secondary metal used only in engine parts, wheels and similar small aircraft accessories.

Chief deterrent to welding magnesium has been its inflammability. It burns like paper. Exposed magnesium parts in planes are coated with a secret fire-resistant paint. Ordinarily, this metal will ignite from the heat of the welders electric arc. Thomas E. Piper, a Northrop process engineer, has revealed

(Continued on page 128)

THE TOOL ENGINEER



**"PUT IT ON THE BLANCHARD"**

**CHECK THESE ADVANTAGES OF BLANCHARD GRINDING**

- ★ Production
- ★ Adaptability
- ★ Fixture Saving
- ★ Operation Saving
- ★ Material Saving
- ★ Fine Finish
- ★ Flatness
- ★ Close Limits

..... Especially valuable on jobs like the one illustrated.



**BLANCHARD GRINDING**  
*also cuts assembly cost*

The speed with which parts can be assembled is a direct reflection of machining operations. All the flat surfaces on the pump parts, shown above, were ground on a Blanchard No. 18 Surface Grinder. This manufacturer is keeping his assembly cost low because the surfaces are flat and parallel and the finish is excellent. The accuracy needed for tight joints and correct alignment is maintained without sacrificing production.

**The BLANCHARD MACHINE COMPANY**  
64 STATE STREET, CAMBRIDGE, MASS.

Send for your free copy of "Work Done on the Blanchard." This book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.





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TAPER**

# ARBORS

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FOR ALL MACHINES**

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BROWN & SHARPE TAPERS

SHELL END MILL ARBORS  
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CONVERSION ADAPTERS  
CUTTER CHUCKS  
SLEEVES AND SOCKETS  
CUTTER CHUCK ADAPTERS  
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CENTERING PLUGS  
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MISCELLANEOUS ACCESSORIES

WRITE FOR NEW ARBOR CATALOG No. 450 CONTAINING DETAILED INFORMATION

**SCULLY-JONES AND COMPANY**

1901 SO. ROCKWELL ST., CHICAGO, ILLINOIS

that magnesium can safely be arc-welded if the hot metal is surrounded with helium to exclude atmospheric oxygen. The helium also cools the molten metal, and is said to act as a metal-cleaning flux.

Piper said that arc-welded magnesium would immediately simplify aircraft manufacturing processes and eliminate "the use of hundreds of thousands of rivets that go into the conventional plane."

As a war-time development, magnesium welding will remain an American monopoly. Reason: this country has the only known reserves of helium gas.

## Sponge Iron

Still on the subject of raw material shortages, steelmen's faces brightened last month when the U. S. Bureau of Mines decided to risk \$500,000 on a hurry-up development of previously impractical sponge iron manufacture. A substitute for scrap iron and steel, the ore is not smelted but mixed with pulverized coal (natural gas can be used) and coke, then fed to a rotary kiln. After the kiln has been heated to 1,800-degrees F., the powdered coal robs the ore (iron oxide) of its oxygen, and then turns into gas. What remains is fairly

pure iron granules which have a spongy texture. This is a material that can be fed into steel furnaces instead of scrap. Success in the project will head off the otherwise inevitable decline in steel production, and may even reduce the cost of steel as much as \$5 a ton. Though the steel industry has spent millions during the past 90 years in efforts to perfect the process, sponge iron production has been futile in this country. From Sweden and Finland comes the good news that the metal is being turned out profitably there.

## Man Power

The second bottleneck in war production is man power. Though approximately 15,500,000 persons were engaged in direct war employment July 1, the War Manpower commission estimates that another 5,000,000 workers must be added to war industry employment rolls in the next six months.

Where will the workers come from? That's what's worrying the government. But just as the time required for conversion of American industry was over-estimated, likewise may be figures on employment requirements. In war industries booming today, management and labor generally are bending every effort to make available man hours count in the fight for victory. In some instances, these efforts have taken a peculiar turn. Witness, for instance, the "musical pep cocktail" which greets workers at the lamp division of the Westinghouse Electric and Mfg. Co., Bloomfield, N. J. For 15 minutes workers assemble for the first morning shift and through five half hour periods thereafter during the shift music is broadcast at periods designed to coincide with "let-down" or fatigue among workers.

Music or not, the fact remains that more workers will be required to operate the new machines flowing from the shops of machine tool makers. The War Manpower Commission further estimates that among a long list of occupations in which extreme shortages exist, the ration of demand to supply in boring-mill operators is 16 to one, internal grinder operator, tool designer and die maker all 15 to one. Those are real shortages!

## Cooperation

Equally important as managerial efficiency in war production is an enthusiastic effort on the part of labor. Here, portents are encouraging. At thousands of plants throughout the country, a new spirit of willingness and cooperation among workers is apparent. That America can lose the war is now realized by a vast number of the men behind the

(Continued on page 130)



## DIE SPRINGS IN STOCK FOR ALL PRESSES • • •

**FREE! WRITE FOR YOUR COPIES**



New Muehlhausen Die Spring Folder describes and prices 206 sizes of die springs for high speed, regular and heavy duty presses.

Muehlhausen Die Springs are available in three types—Series "S" for high speed presses; Series "M" for regular speed presses; and Series "HD" for heavy duty presses. Over 200 sizes are stocked, ranging from 1 to 15 inches in length and exerting pressures from 80 to 3000 lbs. Each size and type is specially designed to meet the rigorous demands of die work. Muehlhausen's complete stock assures you of immediate delivery.

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**MUEHLHAUSEN**  
**SPRINGS**

EVERY TYPE AND SIZE



ANOTHER RUBBER SHORTAGE PROBLEM SOLVED

# SAFETY ANNOUNCES A NEW CENTERLESS REGULATING WHEEL

MADE OF **Saftoid**

SAFETY Research Engineers after months of research and experimentation, have perfected a new revolutionary material SAFTOID, to take the place of rubber in Feed Wheels on Centerless Grinders. SAFTOID has undergone the most severe tests under the most severe plunge-cut and through-feed operations, in every case the new SAFETY wheels have proved to be more economical, have done a better job and lasted longer than ordinary rubber wheels.

## 7 POINTS OF SUPERIORITY

### SAFTOID CENTERLESS REGULATING WHEELS

- |   |  |
|---|--|
| 1 Less dressing is required.            | 5 Wheels constructed of SAFTOID give 25 to 100% longer life. |
| 2 SAFTOID eliminates chipping of edges. | 6 SAFTOID Wheels cost less.                                  |
| 3 SAFTOID holds its shape longer.       | 7 Eliminates worry about rubber shortage.                    |
| 4 SAFTOID is more economical.           |  |

SAFETY is now in a position to prove the economy and dependability of the new SAFETY SAFTOID WHEELS. Practically all standard sizes are available for immediate shipment. We would like to show you how SAFETY engineers have solved one rubber shortage problem. Make tests in your own shop with the New SAFTOID Feed Wheel.

Write, Wire or Phone 4651



**THE SAFETY GRINDING WHEEL & MACHINE COMPANY**

SPRINGFIELD, OHIO

**Sales Offices in Principal Cities**



men behind the guns.

Choosing the slogan, "Front Line Trenches Begin at Your Benches", employees of the Greenfield Tap and Die Corp., have signed individual pledges that they will push the output of tools and gages needed to produce military material to new high. Insignia buttons displaying the GTD seal "Over-the-Top" are worn by all workers who have signed up. Such plant sponsored campaigns are spreading like a prairie fire.

#### Pledges

Another example of this hopeful trend may be found among the employees of

the big Westinghouse organization. As a result of the efforts of the Company's War Production Council, workers in the concern's plant at Mansfield, Ohio, are signing a pledge which reads: "I pledge myself wholeheartedly to every phase of our War Production program. Specifically I agree to—avoid talking—which means I will not tell my family, friends or acquaintances anything about the type, kind or extent of war production material which Westinghouse is building." The point is stressed that signing the pledge is not a duty, but a privilege of the employee. A pocket card with the

worker's pledge is provided to display to persistent questioners.

Stimulating plans to push production now number in the hundreds. Among these is one announced by the New Britain Machine Company, whose "Perfect Attendance Awards" are designed to keep men on the job. Keeping men on the job is not an easy task, even with the full cooperation of workers. Carelessness has been described as "America's Seventh Column." Work accidents last year cost the nation's industry 180,000,000 man-days. Victory can also be lost through fatal accidents on the home front. Accidents due to carelessness last year resulted in the death of 102,500 Americans and injury to 9,000,000 others.

#### Award

In a ceremony broadcast over a nation-wide hook-up, credit was paid the machine tool industry when the Army and Navy star was raised over the plant of the Van Norman Machine Tool Co., in Springfield, Mass., last month. The award was made jointly by Under Secretary of the Navy James V. Forrestal and Under Secretary of War Robert P. Patterson.

### NEW BOOKS

*How to Read Electrical Blueprints* by Gilbert M. Heine and Carl H. Dunlap. 318 pp. \$3.00. American Technical Society, Drexel Avenue at 58th Street, Chicago.

Thoroughly indexed, this book contains 301 illustrations and 9 full sized blueprints drawn to scale plus 204 questions with answers. It is planned for self-study work, for use in vocational training schools, and for National Defense training classes.

*Plastics* by J. H. DuBois. 295 pp. \$3.00. American Technical Society, Drexel Avenue at 58th Street, Chicago. A simplified presentation of the manufacture and use of the important plastics materials and products, this book contains tables of their properties and the basic design information required by engineers and designers.

This book is said to be written for actual users of plastics, who need basic information on these materials yet cannot spend the time required for a detailed study of the chemistry involved and the complex problems of those who manufacture the materials.

After preliminary study, this book is intended to serve as a reference handbook, to be consulted for new design and manufacturing problems.

## NEW LOW-COST 14" BAND SAW FOR PRECISION CONTOUR SAWING

**It Is Also  
An All-Purpose  
Cut-Off Machine For**

**IRON & STEEL  
BRASS & COPPER  
ALUMINUM & ZINC  
WOOD & PLYWOOD  
BUILDER'S BOARDS  
BRAKE LINING  
CASTING SPRUES  
ASBESTOS & RUBBER  
PIPE • FIBER  
PAPER • PLASTICS**

**Or Other Tough  
Industrial Materials**



#### SPECIFICATIONS

Throat depth—13½". Under Guide Clearance—8⅝". Blades, width—⅝" to ¾" wide; length—98". 8-Speed Gear Box Drive—92, 128, 183, 250, 1650, 2420, 3260, 4100 ft. per minute. Micrometer Set Blade Guides with New Type Jaws. Height—67"; Floor Space—27½" x 29"; Weight—365 lbs. Model shown \$214.50, F.O.B. Factory, with ½ h.p., 1 ph. motor. Blade Welder for inside cutting, \$90.

#### For Toolroom or Production

The new Boice-Crane is built for use any where in the plant—right in production lines or in foundries for gruelling continuous use, also for exacting tool room use.

Big savings on all straight, angular and contour cuts. For removing metal roughing out die blanks, cams, punches, etc., the savings over ordinary methods like milling and shaping are positively astounding.

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**BOICE-CRANE CO.  
TOLEDO, OHIO**

**POWER TOOLS FOR METAL AND  
WOOD-WORKING TRADES**

## Glimpses of Early Mechanics

(continued from page 121)

device shows that the brains in charge of the work were of a quality to command respect even at the present day. This is how it was done.

As the obelisk lay on the ground at the quarry a double canal was dug from the river, and carried under the stone at two places, so that its weight was supported at the middle and the two ends. Boats loaded with stones were run underneath the obelisk, and the stones unloaded, thus bringing the boats up to the obelisk instead of letting the obelisk down onto the boats. In unloading the obelisk the reverse process was carried out.

### Modern Methods

But when an obelisk had been moved to its place of erection and unloaded from the boats the problem of setting it up on end was the most serious of all. When the obelisk now standing in New York was erected in the 1880's the task of changing its position from horizontal to vertical gave the engineers in charge many anxious moments. The obelisk was en-

cased in wood and braced by screw trusses. Steel axles projected from these trusses at the center of gravity of the stone. The obelisk, in a horizontal position, was raised by screw jacks until it was at the proper height. Steel supporting towers were then placed under the axles, and the jacks removed. As the last jacks came away every one held his breath lest the stone should bend enough to crack; but the trusses held, and the stone did not break. It was then slowly and majestically turned into a vertical position, and the danger was over.

Were modern engineers called upon to do a job like this without steel braces or screw jacks it may well be doubted whether there would be any bidders for the contract; and yet this work was performed in ancient Egypt, not once, but dozens of times. The method used was very ingenious.

### Obelisk Pedestal

The pedestal for the obelisk was first prepared, and around it were built up walls of earth, Nile mud tamped into place and allowed to dry thoroughly. The space within these earthen walls was then filled with dry

sand from the desert. On one side of the walls there was built a long inclined plane reaching to the top of the wall, and up this incline the obelisk was pushed on rollers, bottom first. On reaching the top the obelisk was pushed just far enough over the earthen wall so that its base rested on the sand within. An opening was then made at the bottom of the wall, and the sand removed, a bucketful at a time. The sand ran down gradually, as in an hour glass, and the obelisk settled down to a vertical position on its base.

### "I Take My Hat Off"

I know of no other country than Egypt which can show so great a record of accomplishment for so little in the way of mechanical equipment. The skill and ingenuity involved in these ancient works is remarkable. The French engineer who transported and set up the obelisk now standing in Paris said, when the work was successfully accomplished: "I take my hat off to those old Egyptian engineers!" And well do they deserve the title.

## A TOOL CONSERVATION PLAN

Because new tools and parts are at a premium during this critical period, manufacturers of electric and air tools have developed plans of conservation to help the users of such tools lick their problems of maintenance and conservation.

Among such plans, one developed and proposed by the Rotor Tool Company of Cleveland is particularly significant for its concrete and practical suggestions to the man who handles the tools. Like other such educational programs, a poster acts as a preface to a booklet and gives general hints on the care of portable tools and parts. Emphasis is placed on the importance of this subject to the management, maintenance men and machine men.

The poster acts as a preface to the booklet and gives many general hints on the care of portable tools and parts. Such subjects as lubrication, clean air, moisture, power, new tools, and safety are discussed. Suggestions are practical: "When a Tool Loses Power," the following steps are given: "1. Check the air strainer. If dirty, blow



out and wash. If wire mesh is gone, replace. 2. Check the Rotor Blades. If any are stuck, sand lightly until they slide freely in the slot. Badly worn or broken blades should be re-

placed. 3. Check the governor to see that it is clean and works freely. 4. Check the air pressure. If below 90 lbs. at the tool, the tool will not have full power. 5. Check for leaks in air lines. One opening  $\frac{1}{8}$  inch in diameter will waste 23.7 cu. ft. of air per minute—more than enough to run one die grinder. It represents a waste of \$44.41 per month. 6. Check the air compressor to see that it is working properly. 7. Check the air hose.  $\frac{3}{8}$  and  $\frac{1}{4}$  inch bushings restrict the flow of air and reduce pressure at tool. Wherever possible, use  $\frac{1}{2}$  inch instead of  $\frac{1}{4}$  inch air hose."

To men faced with the problem of tool conservation the Rotor booklet is interesting for its discussion of such subjects as the repairing of blades and bearings.

The service engineer of the manufacturer is the third link in this particular plan. It is up to him to see that the conservation plan gets to the maintenance man. He must answer questions and show him how to do the job. It is up to the manufacturer's service engineer to start the maintenance man and the machine worker "thinking" conservation.

# NEW EQUIPMENT, Materials, Processing



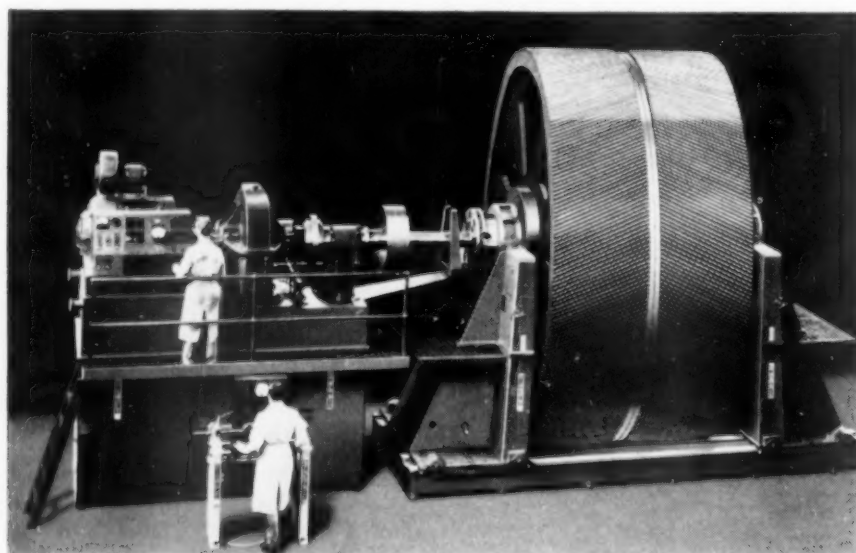
## BALANCING MACHINES

(H25)

Because wartime industry requires balancing equipment with extraordinary capacities, the Gisholt Machine Company, Madison, Wisconsin has just announced the broadening of the overall range of its dynetric balancing ma-

of operation, convenient hose lengths which facilitate the servicing of hard-to-reach bearings and housings, combination control valve and meter, outlets for both high pressure and volume lubrication, and facilities for handling all grades of grease, oils, and slushing compounds.

All models are supplied with air compressor, or with air hose mounted on reel for quick connection to plant air lines. Units are also equipped with shelves, racks, and drawers for tools and waste. Complete Alemite service stations, mounted on a base, measure three by seven feet and three by eight feet.



The Large and Small of Gisholt Balancing Machines  
50 tons for the largest, an ounce for the smallest.

chine line to the extremes of 1 ounce and 50 tons.

This expansion of effective static and dynamic balancing capacity has been brought about by two major developments in this type of machine. The first to be manufactured is the new Gisholt type S dynetric, smallest of the entire line and said to balance parts weighing as little as one ounce. The second development is the new floor type balancing machine, built to balance parts up to 100,000 pounds in weight, 240 inches in length, with a 200 inch swing.

## PORTABLE STATIONS FOR LUBRICATION

(H26)

Planned for the lubrication of war production machinery, three new portable lubricating stations have been announced by the Alemite Division, Stewart-Warner Corporation. Each unit is a complete lubrication department in itself and is designed for mounting on hand or electric trucks.

Other outstanding features claimed of these portable stations include ease

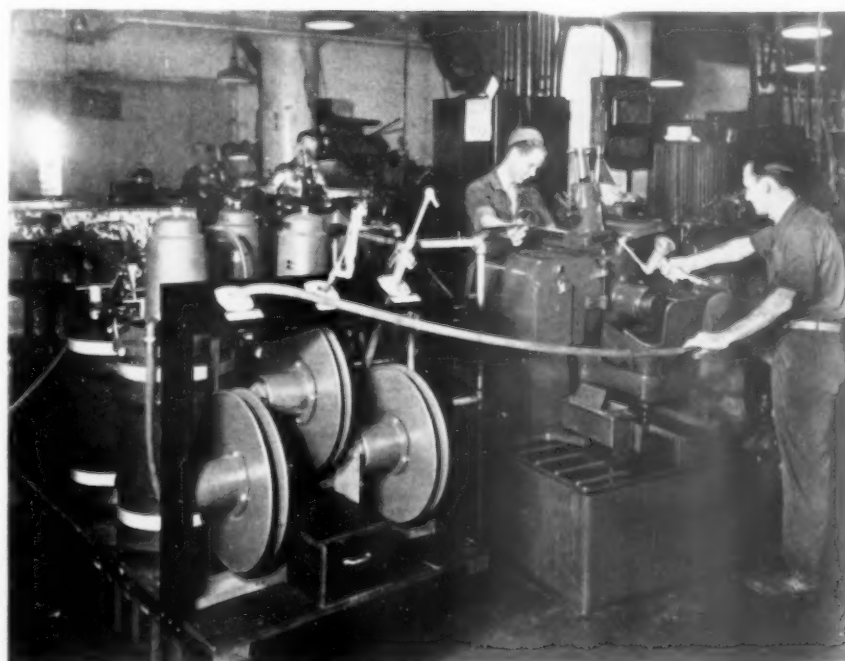
## ELECTRIC HYDRAULIC POWER UNIT

(H27)

A new electric hydraulic power unit, particularly designed and developed for hydraulic chucking installations on machine tools but adaptable to other similar applications, has recently been introduced by Logansport Machine, Inc., Logansport, Indiana.

This new power unit is said to be not only capable of operating additional cylinders for tailstock or similar requirements, but it also sustains the pressure during the different executions of the work cycle. A spring loaded accumulator permits the maintaining of this pressure without the electric motor running constantly.

A built-in pressure switch automatically shuts off the electric motor when the accumulator has been charged to 550 PSI and starts the motor when the



Alemite Portable Service Stations  
Each unit is a complete lubrication department.



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**1** New catalogs—bulletins listed in this issue.

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Simply fill out the card, indicating the information or service you desire, and mail. Be sure to write, in the square, the identifying number of the catalogs or bulletins covering new products described. In answering an advertisement, include the name of the advertiser and indicate by a cross if literature is desired or if company representative should call. No stamp is required.



**USE THIS CARD** for requesting new catalogs and bulletins listed in this issue.



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<p>Write in square, number of item describing one catalog wanted ➔ <input type="checkbox"/></p> <p>NAME _____</p> <p>COMPANY _____</p> <p>ADDRESS _____</p> <p>TITLE THE TOOL ENGINEER, AUGUST 1942</p>	<p>Write in square, number of item describing one catalog wanted ➔ <input type="checkbox"/></p> <p>NAME _____</p> <p>COMPANY _____</p> <p>ADDRESS _____</p> <p>TITLE THE TOOL ENGINEER, AUGUST 1942</p>
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<p>PAGE NO. _____</p> <p>NAME OF ADVERTISER _____</p> <p><input type="checkbox"/> Literature <input type="checkbox"/> Have Representative Call</p> <p>NAME _____</p> <p>COMPANY _____</p> <p>ADDRESS _____</p> <p>TITLE THE TOOL ENGINEER, AUGUST 1942</p>	<p>PAGE NO. _____</p> <p>NAME OF ADVERTISER _____</p> <p><input type="checkbox"/> Literature <input type="checkbox"/> Have Representative Call</p> <p>NAME _____</p> <p>COMPANY _____</p> <p>ADDRESS _____</p> <p>TITLE THE TOOL ENGINEER, AUGUST 1942</p>
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*They are provided for your convenience in requesting information and service . . . . .*

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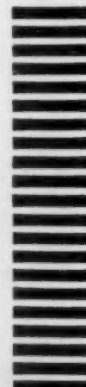
### THE TOOL ENGINEER

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TO CALL**

accumulator has discharged sufficient oil to reduce the hydraulic pressure to 450 PSI.

Capacities of this Model 5036 include the following: pump delivery, 8 gallons per minute; pressure range, 550 PSI maximum to 450 PSI minimum; motor requirements, 3 hp, 1200 rpm, NEMA frame, No. 254; oil tank, approximately 15 gallons; and capacity of accumulator, 50 cu. in. at 550 PSI.

right hand models. This miller is designed for milling operations on small parts requiring accuracy and intricate cuts.

This miller has a cam operated table feed, the hardened cam operating against a sector to move the table. This cam controls the cycle of fast approach, desired length of cut, and fast return to loading position and is claimed to enable the operator to handle a battery of

tion of metal parts, either machined, finished, or rough has been announced by the Sturdy-Bilt Equipment Corporation, Milwaukee, Wisconsin. It was designed for the cleaning of war production small parts, shells, cartridges, and munition parts.

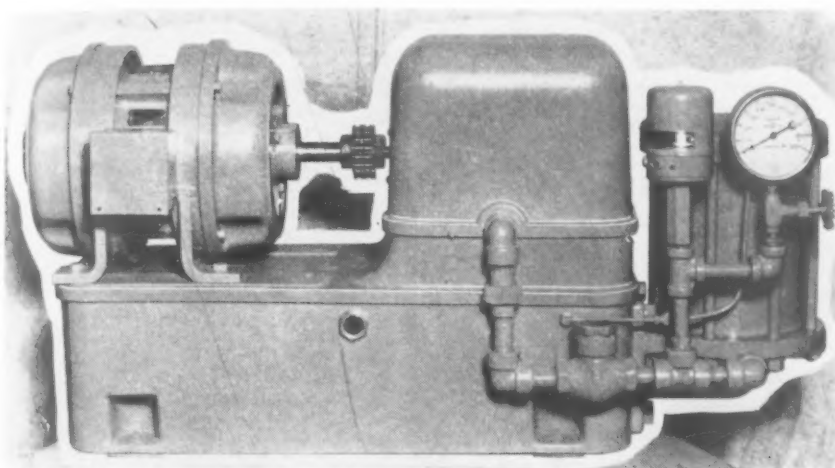
Besides the customary method of powerful hydro washing, this machine offers a long dormant soak. In this process the parts are subjected to a long soaking in very hot light alkali solution water. This is followed by very hot and powerful clean water washes to remove any alkali or remaining dirt or chips. The clean parts dry thoroughly before they reach the unloading platform.

A chip remover scrapes the chips into a receptacle at one end of the machine and the chips, if of scarce metal, can be salvaged. The operating mechanism is said not to be complicated and no adjustments need be made to clean a large variety of items.

#### HYDRAULIC DRAW PRESS

(H30)

Having a 200 ton capacity, this hydraulic double-acting draw press produced by Baldwin Southwark division of The Baldwin Locomotive Works, Philadelphia, is being used for the production of 155-mm shell forgings.

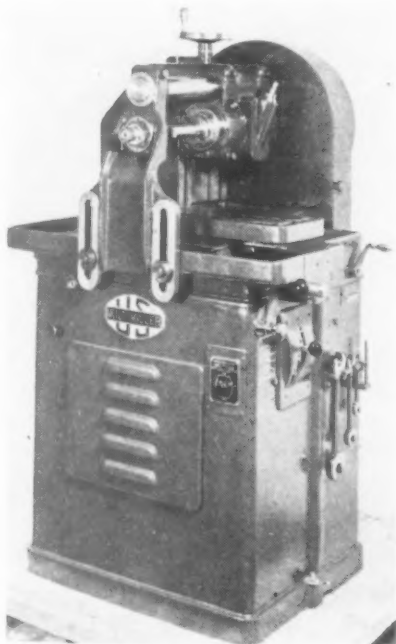


**Logansport's New Electric Hydraulic Power Unit**  
Designed and developed for hydraulic chucking installations.

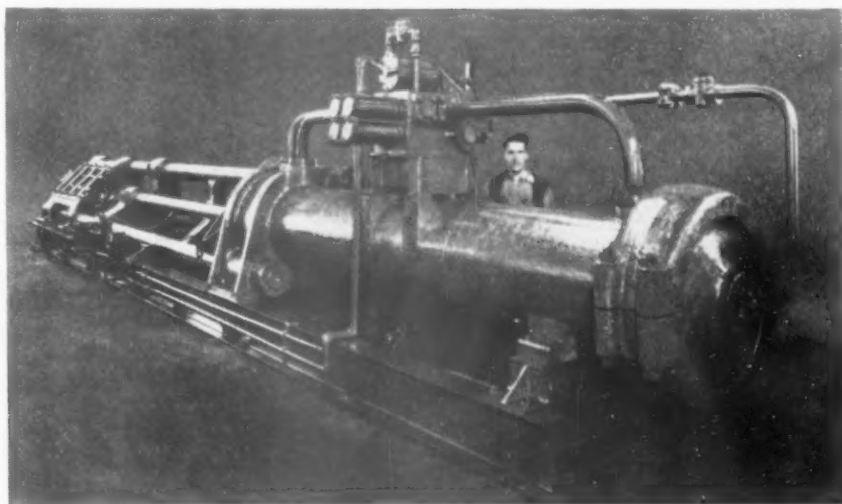
#### MILLING MACHINE

(H28)

Equipped with a heavy duty overarm support, the Multi-Miller manufactured by the U. S. Tool Company, Ampere, New Jersey, is built in both left and



**U. S. Tool's Multi-Miller**  
Features overarm support.



**Baldwin Southwark Hydraulic Double-Acting Draw Press**  
Used for the production of 155-mm shell forgings.

machines.

The miller has a gear change box and a shift lever is used to change the table feed speeds. No pick-off gears are required and speed changes can even be made while the machine is running.

#### METAL PARTS WASHER

(H29)

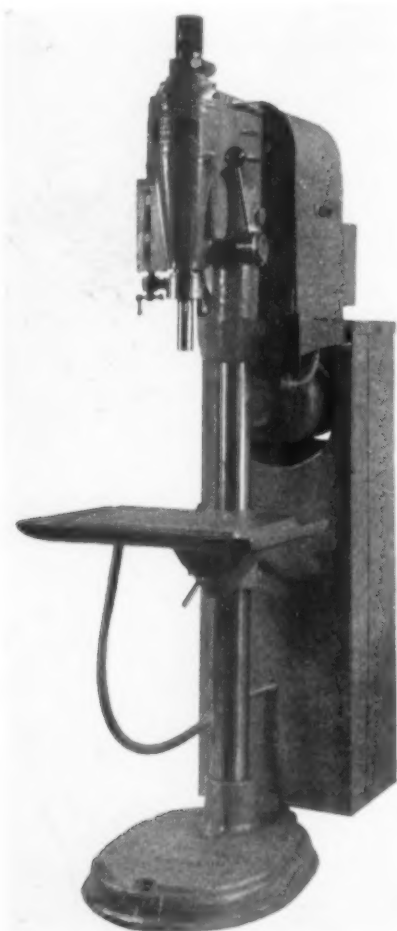
A new metal parts washer for the soaking, washing, drying, and prepara-

This press is equipped with four die heads and one stripper head. The extreme end of the piston is supported by a well guided crosshead with adjustable shoes on the two press columns. Mounted on a structural steel bed, the machine has a stroke of 11 feet, with a piston diameter of 19 inches and piston rod diameter of 14 inches.

Other features include the drawing mandrel extension, which is guided in a bronze-lined guide casting, and the four-



way operating valve and piping mounted on the top cylinder. The floor space required is 45 feet by 6 feet.



**Cleveland Tapping Machine**  
Has sensitive depth stop gauge.

### TAPPING MACHINE

(H31)

A new lead screw controlled tapping machine called the Model D is being offered by the Cleveland Tapping Machine Company, 1725 Superior Avenue, Cleveland. Said to be completely automatic, this machine has a spindle that can be stopped in any position desired and started from that position in either direction.

The depth stop gauge is claimed to be so sensitive that the reverse of the spindle is controlled within two cycles and the vertical travel of the spindle can be adjusted to the exact depth desired by a visible indicator on the face plate.

Because of the smooth operation of the bi-metallic clutch disc, it is said that the clutch can be instantly adjusted for a 10-32 or a  $\frac{3}{4}$  NC. The lead screw nut and sleeve are mounted on the top of the housing and fastened to the spindle. The machine has four speeds — 275, 375, 475, and 600 r.p.m.

### DEEPFREEZE INDUSTRIAL UNIT

(H32)

Made to operate in temperatures ranging from 40 to 120 degrees below zero, this new unit for the chilling of metal is announced by the Motor Products Corporation, North Chicago, Illinois. The use of subzero temperatures in the tempering and hardening of high speed tool steel is said to produce a much better material for cutting tools with increased strength and ductility.

Among the numerous applications of Santocel Deepfreeze is contraction in compound fitting of metal parts. This facilitates slide fits in assembly operation, relieves strain and possible fractures.

Pictured is a unit installed in a machine tool plant, the operator inserting a machine tool spindle in it. It is claimed that this is done so that anti-friction precision bearings can be assembled easily and permanently without damage. Another important use of the unit in this plant is shrinking steel sleeve type bearings.



**Motor Products Deepfreeze Unit**  
120 degrees below zero temperatures.

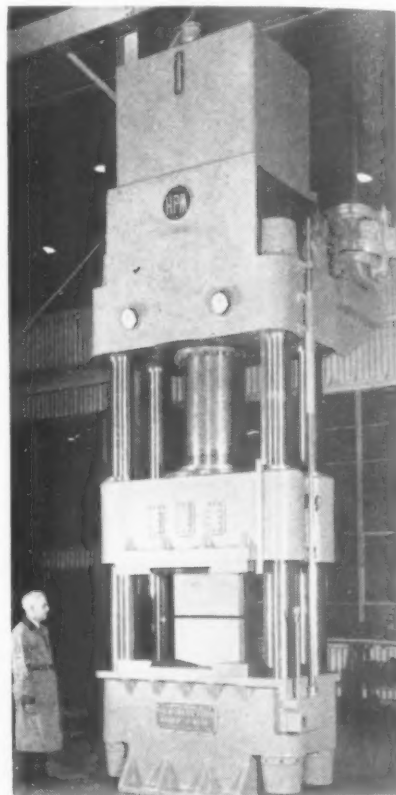
### FORGING PRESS

(H33)

The Hydraulic Press Manufacturing Company, Mount Gilead, Ohio, announces a self-contained, fastraverse forging press which is all hydraulic and eliminates the use of steam. With control valves entirely eliminated, the press is started, stopped, reversed and its

speed changed by varying the pump stroke.

All pressure and working parts are lubricated by the operating medium which is a clean, cool high grade lubricating oil. As this oil is being continuously filtered and cooled, it is claimed that it has no chance to become loaded with dirt and abrasives.



**Fastraverse Forging Press**  
Eliminates the use of steam.

The pressure cylinder of the press is smooth bored its entire length and the piston type ram is metallic piston ring packed. Other features include the closed circuit operating system, the patented surge valve and the HPM Hydro-Power radial variable delivery oil pressure pump.

The entire press operation is controlled from one hand lever. The press is closed rapidly by gravity and the press cylinder is maintained full of oil by the surge valve. Rapid control for planishing operations is said to be possible because the pressure stroke automatically follows with no appreciable time lag for the cylinder is already full of oil.

### NOTCHING DIE

(H34)

The addition of a new notching unit for notching aircraft bulkhead clear-

# How to Simplify YOUR PROBLEM OF SEPARATING TOOL STEEL SCRAP

Get in the Scrap  
FOR VICTORY

The easiest and best way to separate tool steel scrap is to *do it at each bench, machine and press*. But if, in spite of your best efforts, some scrap does get mixed—*Spark Testing* is a quick way to separate it.

By simply holding the steel against an emery wheel and watching the color of the lines and bursts, and the character of the spark stream, you



TO HELP YOUR MEN  
become familiar with Spark Testing

This new *Spark Testing Guide* contains ten different spark diagrams like the one above. It indicates *spark characteristics* that identify each Carpenter Matched Tool Steel. With the chart, it is easier for your men to become familiar with this method of steel identification. A note on your company letterhead, and a Carpenter *Spark Testing Guide* is yours.

TOOL MAKERS who "know sparks" will not waste time and material by making tools from the wrong steel. This quick-reference guide is something that has long been wanted for Tool Room use . . . to help conserve metal and save time.

★ ★ ★ ★ ★

get a quick indication of the major elements present—such as carbon, silicon, molybdenum, etc. Remember, of course, that *Spark Testing* does not *analyze* the steel. It *indicates the type* and checks the identity.

If you want more information on *Spark Testing* as a means of simplifying the separation of tool steel scrap (and even tool steel stock), write for the Wall Chart described below.



The spark stream is full, having many heavy carrier lines (1)—light in color, and varying in length and thickness. The thicker ones are continuous, while the thinner ones are disjointed.

The thicker lines gradually swell into bright orange tongues (2) having a slight curvature, some upward and some downward. There is a tendency for some ghost-like lines to be carried around the periphery of the grinding wheel. Some few sprigs (3) and an occasional suppressed burst (4) are visible.

SPARK CHARACTERISTICS OF VARIOUS ELEMENTS are clearly described on this chart. And instructions are given for making the Spark Test. ➡

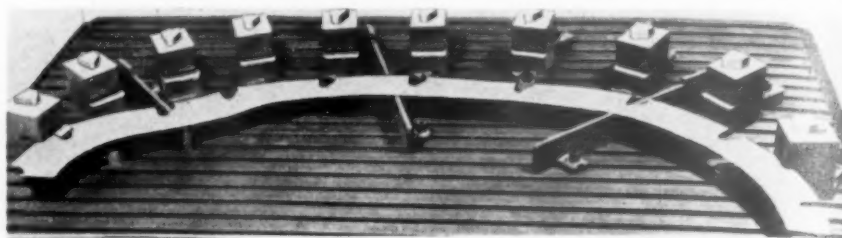
THE CARPENTER  
STEEL COMPANY  
122 Bern Street, Reading, Penna.



# Carpenter MATCHED TOOL STEELS

ances and similar operations has just been announced by The Strippit Corporation, Buffalo, N. Y. Having the same patented features as the Wales hole punching units, the top portion of punch fits into notches in template for instant resetting and removing from rails, templates or T-slotted plates.

These notching units, set up in series, are said to be used for every size and shape of bulkhead. Standard and irregular notching patterns are notched in one stroke of the press ram. Nothing is at-



**Wales Die for Notching Aircraft Bulkhead Clearances**  
Self-contained holder maintains punch and die alignment.

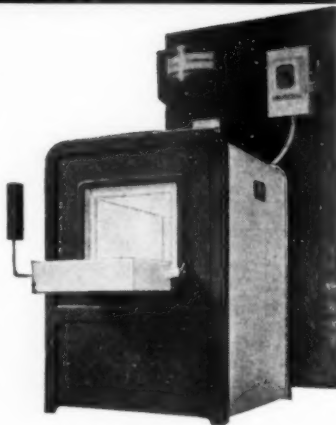


## NOW! A NEW FURNACE FOR HEAT TREATING SMALL PARTS

### HERE ARE 5 OF MANY USES FOR THIS ELECTRIC FURNACE

- 1 HARDENING SMALL MACHINE PARTS**—Do your own heat treating—avoid delays of relying upon overcrowded commercial heat treaters.
- 2 DRAWING OR TEMPERING METAL PARTS**—Use it as auxiliary equipment—save expense of using large furnaces for small parts.
- 3 NORMALIZING OR ANNEALING SMALL PARTS**—Handle this work easily and quickly—save time and money.
- 4 PRE-HEATING FOR HIGH-SPEED HARDENING** or for use on miscellaneous small parts.
- 5 EMERGENCY REPAIR ORDERS**—Use it to handle them immediately and conveniently—prevent shut-downs.

This small compact electric furnace is ideal for small tool and die shops lacking heat-treating facilities. It prevents delays of heat treating due to overcrowded conditions in commercial heat-treating plants. It is compact, inexpensive, handy and easy to operate. Small parts can be handled without heat and power waste of a large furnace. Pre-heating of small high-speed tools can be handled quickly and easily. Repair parts on emergency orders can be rushed to completion in your own plant—no need to send them out for heat treating.



### REPLACEABLE HEATING ELEMENTS

Replaceable nickel chromium resistors embedded in rectangular refractory blocks. Elements form inner walls of furnace chamber, and may be replaced easily and quickly after removing rear panel—furnace structure remains undisturbed.

**FREE** Complete data covering specifications, additional applications, and ordering instructions are included in this new folder. Write for your copy today. Ask for Bulletin No. 50.



### OFFERED IN TWO SIZES

Type	Chamber Capacity	Amps 115 V	Watts	Amps 230 V	Price
MH-3	8" W 6" H 14" L	29.6	3400	14.8	\$124.00*
MH-4	10" W 6" H 18" L		4800	20.9	\$191.00*

\*Includes Cast Nickel Chromium Hearth Plate

**MAX. SAFE TEMPERATURE**—Continuous operation, 1750° F.; Intermittent operation, 1850° F.

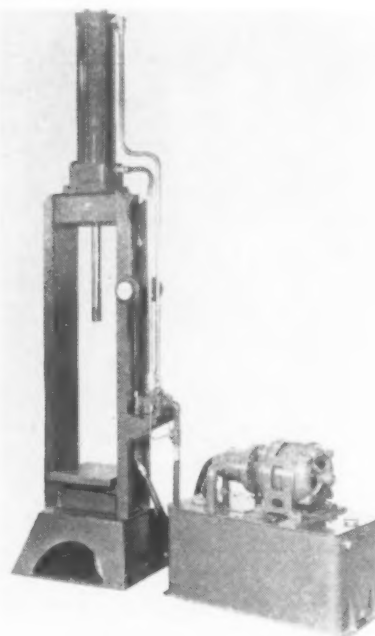
**AUTOMATIC CONTROL**—Indicating Controlling Pyrometer—Thermo-couple and lead wire complete—\$142.40.

**COOLEY ELECTRIC MANUFACTURING CORP.**  
209 S. SENATE AVENUE INDIANAPOLIS, IND.

tached to the press ram and a self-contained holder maintains constant punch and die alignment.

### 25 TON HYDRAULIC PRESS (H35)

The main specifications of an hydraulic press manufactured by Hydraulic Machinery, Inc., Detroit, include a 25 ton pressure capacity, a 30 inch stroke, a closing speed of 4.4 inches per second, and an high pressure speed of .8 inch per second.



**25 Ton Hydraulic Press**  
Has a 30 inch stroke.

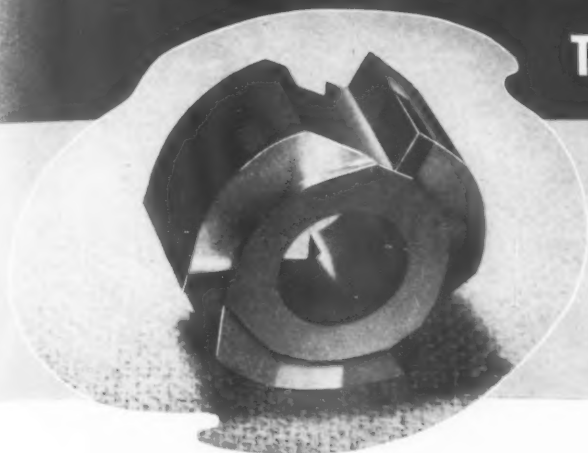
This hydraulic press is of welded steel construction, mounted on a flared base 30 by 30 inches with an overall height of 139 inches. The power unit, shown adjacent to the press may also be installed in another room or building.

Other features include a 5 inch per second opening speed; a combination pump, relief, check and unloading valve; 7½ hp, 1200 rpm, 3 ph, 60 cycle motor; and a manually operated control valve.



# DIAMETERS HELD TO SIZE

## THROUGH 15 BEARING SUPPORTS



*With This  
Cemented-Carbide Tipped*  
**SHELL CORE DRILL**

Special cemented-carbide tipped cutting tools produced by Carbide Fabricators have been given some of the toughest assignments in present day production . . . and they're doing the job!

Illustrated is a Carbide Fabricators shell core drill,  $2\frac{1}{8}$ " in diameter, used for cam bearing holes in cylinder blocks. The holes are first rough drilled for the full length of the block which is  $37\frac{3}{8}$ " long.

Originally, steel cutters were used on this job, but extreme difficulty was encountered in holding the bearing holes to specified size. This was due to fast wear of the cutter blades, partially caused by the fact that little support is provided for the cutter during the operation. The bar which drives the core drill has a roller guide bushing back of the cutter which supports the cutter from one bearing to the next. There are fifteen bearings.

With the application of cemented-carbide to this job by Carbide Fabricators, large numbers of blocks are now completed—with diameters held to within .001"—without it being necessary to sharpen the tools.

In some of the cutting operations in your production, special cemented-carbide tipped tools will do the work faster . . . more accurately . . . cheaper. Upon receipt of your blueprints, Carbide Fabricators can provide you with full details—including prices—on the tools you're looking for.



*Carbide Fabricators*

**BERKLEY  
MICHIGAN**

DIVISION OF MORSE TOOL COMPANY • DETROIT

## TWO GUN PEDESTAL WELDER

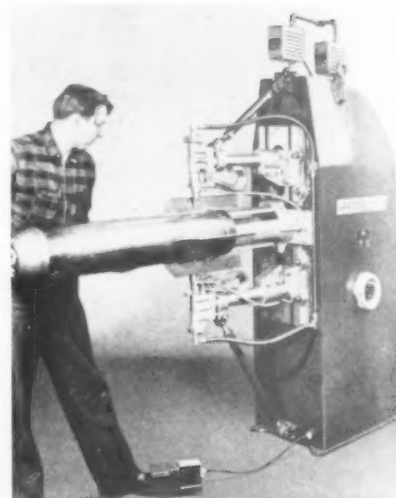
(H36)

A standard Progressive pedestal welder made by the Progressive Welder Company, Detroit and equipped with two guns, an upper and a lower, is being used to "stitch" fins on housings for the army's giant parachute flares. This "stitching" is accomplished by rows of spot welds.

The center electrode of the welder is fixed and serves as a mandrel for guiding the housing. The operator pushes the

housing along, between welds, the machine automatically repeating the welding operation as long as the foot switch is depressed.

Only one timer is required because both guns weld simultaneously. To insure that one gun does not weld without the other one, this machine has been equipped with two interlocking pressure switches. A total of 36 welds are required for each housing, 18 welds for each pair of fins. This same machine spot welds the end ring to



Progressive Pedestal Welder  
"Stitches" fins on flare housings.

the main housing.

## SQUARING SHEAR

(H37)

Recently installed in a large bomber plant, this new, long length power squaring shear manufactured by the Niagara Machine & Tool Works, Buffalo, has a cutting length of 20 feet. By utilizing the gap in the housings, even longer sheets can be squared, trimmed and slit.

Straightness and correct clearance of knives throughout the cutting length is said to be maintained by the massive bed and housings together with the triangular section crosshead.

Other features of the machine include a self-measuring, ball bearing, parallel back gage that measures in increments of 1/128 inch; full visibility of cutting line to facilitate cutting to a scribed line; and a drive mechanism that operates on anti-friction bearings and is completely enclosed in an oil-tight case.



Niagara Squaring Shear  
Has 20 foot cutting length.

## AUTOMATIC SPACER

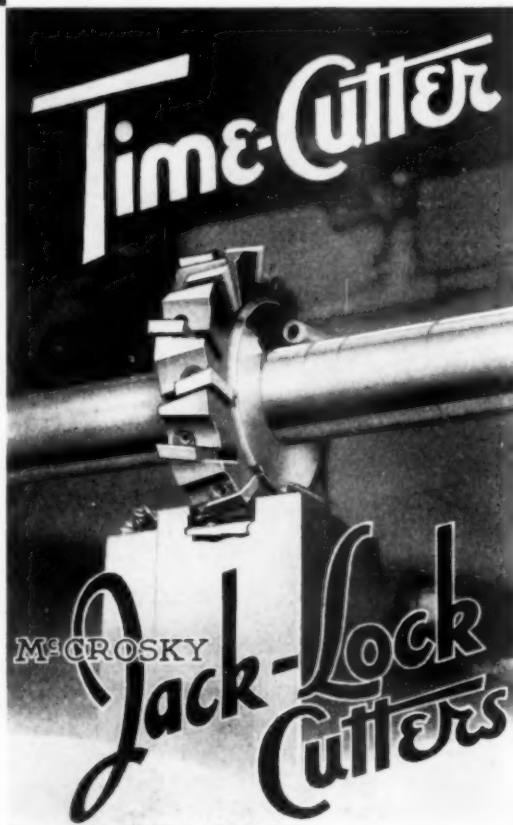
(H38)

Said to eliminate template-making

THE TOOL ENGINEER



ENGINEERED into  
McCrosky JACK-LOCK  
Staggered-Tooth Mills  
are longer blade life,  
shorter down-time,  
McCrosky  
JACK-LOCK Wedges  
lock and unlock  
without hammering.  
McCrosky  
Adjusting Screws  
minimize blade stock  
removal in resharpening.  
McCrosky  
Tru-Ground Serrations  
mean greater rigidity  
at high speeds.



Shell End Mills ★ Half-Side Mills  
★ Face-Milling Cutters ★ Carbide-Tipped Cutters ★ Staggered-Tooth Mills  
ASK FOR McCrosky BULLETIN 15-M



## New 7" SHAPER TAKES HEAVIER CUTS!

**PORTER -  
CABLE**

- ★ No chatter
- ★ No gear lash
- ★ Revolutionary  
new chain drive  
gives extra  
speed and  
smoothness



● Now, take really heavy cuts on a small shaper, and forget all about punishing vibration, chatter marks and gear lash. With a reasonably machineable metal, this new PORTER-CABLE 7-inch SHAPER will take 3/16" cuts with a .004" feed at 80 strokes per minute. That's not its limit, but it does tell you that this shaper will do considerably more than you'll ordinarily ask from a small machine.

Here's the reason why: It is made of steel and cast iron—no light diecast parts. It has the weight to "take it." The extra-heavy cast iron crank-pin-plate stores energy like a flywheel, insuring an easy, powerful, steady cut. And the roller-chain drive distributes the strain and wear over five sprocket teeth at a time—there's no gear backlash—no gear marks on the work.

Porter-Cable's exclusive Micro-set ram saves set-up time. The Ani-Speed control allows speed changes from 64 to 175 strokes per minute without stopping the machine. Tapered locating pins give fine adjustment on the tool head and vise. Six automatic cross feeds. The head turns in a full circle. Table traverse, 10 1/2" and vertical travel, 5 1/2".

Phone your local Porter-Cable man (name in classified directory) or write for complete data.

**PORTER - CABLE  
MACHINE CO.**

1610-B N. Salina  
SYRACUSE, N. Y.

## DESIGN HYDRAULIC MACHINES THIS FAST... SIMPLE WAY

Barnes self-contained hydraulic unit complete with tank, motor, pumps and valves for operating two independent traversing and clamping circuits, and one traverse circuit of wheel spoke forging machine.

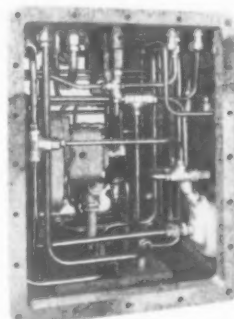


### Use Unit-Type Hydraulic Structures for New Designs

These self-contained hydraulic units are designed to meet specific machine requirements. They are complete with pumps, pump-controls, valves, and oil reservoir. All piping, except to cylinders, is compact and included in the unit.

### Save Design Time...Speed Delivery

Units can be designed and built for control of elements or functions of Milling, Boring, Grinding, Drilling and other metal working machines. They can



also be furnished for operations of other types of machines whose functions can be controlled to better advantage hydraulically. *This hydraulic designing can be done simultaneously with your machine designing.* When your machine is ready for assembly you will have a complete hydraulic unit easy to mount, and designed to meet the needs of your machine — piping each machine cylinder constitutes your total hydraulic effort.

Compact Hydraulic piping eliminates unsightly exterior piping. Circuit is complete, and tested for immediate installation.

**For Complex and Simple Circuits** These standard hydraulic units are in use in mass production machine tools in all of our prominent automotive plants, in simple and complicated machining cycles. For additional data write for the booklet offered below.

**FREE New Data:** Included in this 40 page book are typical installation circuits, complete data covering piston and gear pumps and complete information covering basic elements of construction and installation of standard units used in these highly successful hydraulic circuits. Write for your copy today. Ask for Bulletin T.E. 842.



**John S. Barnes Corporation**

DETROIT, SALES OFFICE  
503 NEW CENTER BLDG.  
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MAIN OFFICE  
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ROCKFORD, ILL.





# IT MAKES NEWS!

When a \$500 Fixture  
Displaces a \$6000 Machine

## With GATCO

ROTARY JIG & PILOT BUSHINGS  
in a fixture — this is  
not uncommon!

Investigate GATCO bushings,  
they may be of great help to you



DUST PROOF AS A WATCH

**GATCO** for CARBIDE BORING  
DIAMOND BORING  
CORE DRILLING  
LINE REAMING  
HOLLOW MILLING  
TURRET TOOL PILOTING

**GIERN & ANHOLTT TOOL CO.**  
1312 MT. ELLIOTT, DETROIT, MICHIGAN

BUILDERS OF DIAMOND & CARBIDE BORING  
EQUIPMENT

HIGH SPEED TOOL CO., GALT, ONT., CANADA  
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THEY LOOK TO THE SPEED AND ACCURACY  
OF CAMPBELL CUTTING MACHINES TO HELP IN  
THEIR DRIVE TOWARD THE GREATEST PRODUCTION  
ACHIEVEMENT IN THE WORLD'S HISTORY

**Abrasive Cutting Machines** for bar stock up to  
6" rounds, flat slabs, tubular and irregular shapes.  
Annealed or unannealed . . . Cut to micrometer-con-  
trolled lengths. No burning. Saves finishing operations.

**Nibblers.** Cut stock up to 72" wide and 1/2" thick.  
Clean, accurate cuts as operator holds work in two-  
hand grip.

Ask to have a Campbell Engineer show you what  
**CAMPBELL CUTTING MACHINES** will do for you. This im-  
plies no obligation whatever on your part.

**ANDREW C. CAMPBELL DIVISION**  
BRIDGEPORT, CONNECTICUT



Cutting Airplane Sheet  
with a Campbell Nibbler

Cutting Slabstock  
with a  
Campbell Abrasive  
Cutting Machine



**AMERICAN CHAIN & CABLE COMPANY, Inc.**  
BRIDGEPORT • CONNECTICUT

**ELECTRIC HEAT TREATING FURNACE (H40)**

The Cooley Electric Manufacturing Corporation, Indianapolis, builder of laboratory and heat treating furnaces, has developed a small electric muffle furnace for fast heat treating of small parts, drawing or tempering small lot small parts, normalizing or annealing small parts, pre-heating for subsequent high-speed hardening, and for emergency repair orders.

Offered in two sizes, the type MH-3

has a chamber capacity 8 inches wide, 6 inches high by 14 inches deep, and has a maximum power consumption of 3400 watts. Type MH-4 has a chamber capacity 10 inches wide by 6 inches high by 18 inches deep with a maximum power consumption of 4800 watts. Type MH-3 operates on both 110 and 220 volt circuits, whereas type MH-4 is available for 230 volt circuits only.

The outer shell of the furnace is of heavy gauge sheet steel interposed between cast iron end frames secured



**Cooley Electric Furnace**  
Small, electric muffle furnace.

through rods. Elements are of the embedded type which afford protection to the element wire from atmospheric attack.

Steel Pin

IT'S MADE OUT OF

# SPEED CASE STEEL

A LOW CARBON OPEN HEARTH PRODUCT

**—because . . .**

It increased production 56%

It saved \$70.89 per ton of steel used

It carburized without soft spots

It had strength equal to X 1020

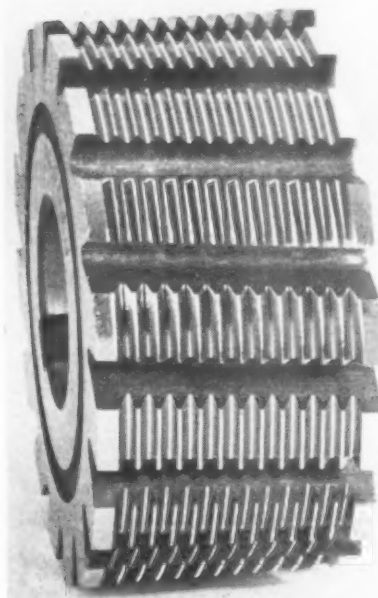
Ductility  
Plus  
Machinability  
(230 SFPM)

In this "all-out" war effort Monarch Steel is co-operating 100%.  
We're helping to "keep 'em rolling" with Speed Case Steel.

Licensee for Eastern States  
**THE FITZSIMONS COMPANY**  
YOUNGSTOWN, OHIO

Licensor  
**MONARCH STEEL COMPANY**  
HAMMOND • INDIANAPOLIS • CHICAGO  
PECKOVER'S LTD., Toronto, Canadian Distributor

MANUFACTURERS OF COLD FINISHED CARBON AND ALLOY STEEL BARS



**Buttress-Thread Milling Cutter**  
Development protects thread ends.

**THREAD MILLING CUTTER (H41)**

The Detroit Tap and Tool Company, 8432 Butler Street, Detroit are manufacturing buttress-thread milling cutters which relieve the ends of the threaded portion automatically by removing the feather edge at the end of the thread as they mill the threads.

The thread milling cutters are available in three basic styles: to relieve one end of the thread only, to relieve both ends, or without plain cutting portions. The illustration shows a style of cutter

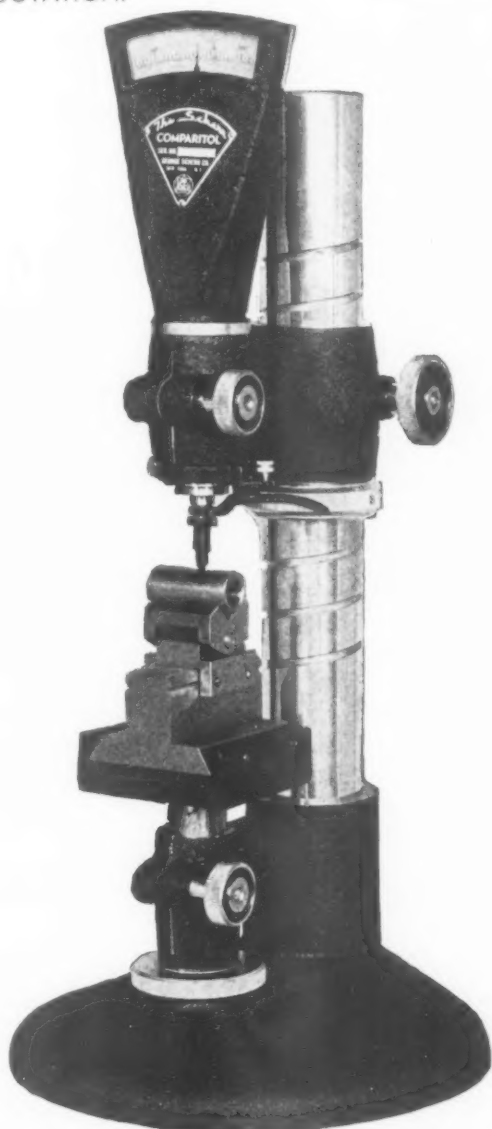
**THE TOOL ENGINEER**



## RAPID INSPECTION to 1/10000" with the Scherr Comparitol

The Scherr Comparitol will enable you to rapidly inspect plug gages, cylindrical ground work, flat pieces and mass produced parts to an accuracy of 1/10000" without dependence upon individual measuring skill. ANY OPERATOR MAY BE TRAINED QUICKLY TO USE THE COMPARITOL.

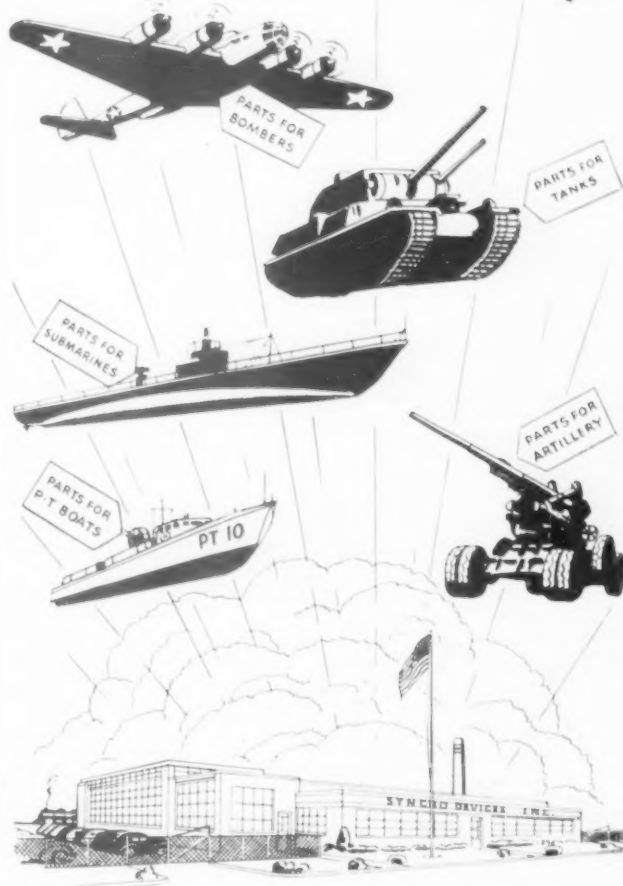
Illustrated is the COMPARITOL with special swiveling V block which shows in an instant out-of-round. The work to be inspected is placed on the V block, turned under the feeler point and any divergence from size or perfect roundness is indicated on the measuring scale. WRITE FOR LITERATURE AND QUOTATION.



Also available are various types of anvils and attachments for special work. Especially developed for measuring crystals, laminations, shims and extremely thin work to an accuracy of 1/10000" is a ball measuring anvil which has just been brought out. Why not write for full details today?

**GEORGE SCHERR CO.** 132 Lafayette St.  
New York, N. Y.

## SYNCRO dedicated to *Victory*



Syncro tools and Syncro craftsmen dedicate themselves to production for Victory . . . in order that freedom of the people, by the people and for the people shall not perish from this earth.

Manufacturing facilities available for development of precision machine tool parts — special tools — fixtures — production parts and plug gauges . . . now and after Victory.

**SYNCRO DEVICES *inc.***

3265 BERMUDA AVENUE

FERNDAL, MICHIGAN

★ Established Nineteen Hundred and Thirty-Two ★

MANUFACTURERS OF PRECISION MACHINE TOOL PRODUCTS

designed to remove the feather edge at both ends. The style supplied suits standard thread milling machines and in both spiral or straight gash types.

Threads on such parts as cylinder heads and propeller hubs are milled by these cutters. This development is said to greatly facilitate assembly operations while at the same time protecting the ends of the threads against damage.

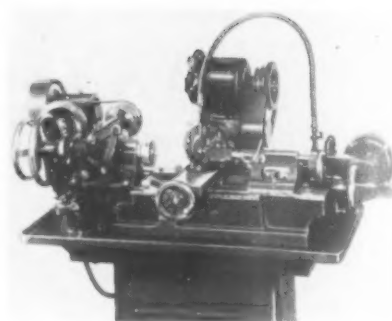
# **THREAD MILLER (H42)**

The most important change in the

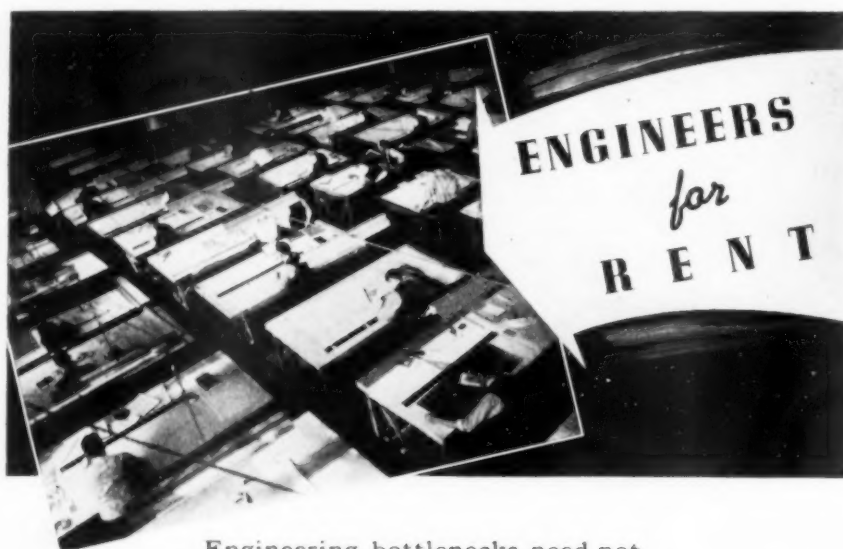
newly re-designed thread miller made by the Waltham Machine Works, Waltham, Mass., is in the use of three motors which allow individual speed change, reverse for both the cutter and the work, and a constant speed for the pump.

These motors are wired so that a single start and stop station controls the machine. The machine can be arranged with speeds suitable for either brass or steel.

Said to be especially designed for small work, this miller has various at-



**Waltham Thread Miller**  
Uses three motors.



Engineering bottlenecks need not delay your production of new items called for by war contracts or war conditions. No need to advertise frantically for men, disturbing your present wage scales, losing precious time in interviews and investigation.



LaSalle fills your temporary engineering needs on a job basis—as many men as needed, as long as needed and no more. Experienced men and supervisors bring you the benefit of having worked on other assignments with similar problems.

Not merely draftsmen, but tool designers, production and executive engineers comprise the LaSalle staff. We're serving leading aircraft and other war producers, and our clientele includes some of the biggest names in American industry. Write, wire or phone for details.



# **LaSALLE DESIGNING CO.**

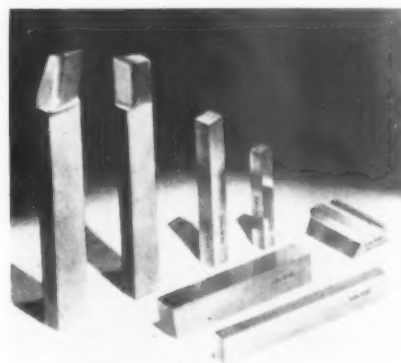
634 West Lake Street, Chicago, Illinois

**TOOL DESIGN • PLANT LAYOUT  
MANAGEMENT ENGINEERING**

tachments available to increase the usefulness of the machine. The attachments are for relieving, internal threading, and multiple cutter threading. The machine can be arranged for cam operation.

# **NEW ALLOY FOR MACHINING STEEL (H43)**

Said to be especially designed to increase the speed of machining steel in production shops, a new cobalt-chromium-tungsten alloy used in "Stellite" 98M2 tools has just been developed by the Haynes Stellite Company, Kokomo, Indiana.



**New Haynes Stellite Alloy**  
Takes heavy roughing cuts.

Heavy roughing cuts are being taken with this new alloy on steel turning jobs with coarse feeds, yet tool life is claimed to be long and economical because the new alloy is well balanced in red hardness, edge strength, and toughness. Specific operations with this new tool alloy include turning, facing, boring, reaming, milling, grooving, cutting-off, forming, spot facing, core drilling, and counter-boring.

These new alloy tools are at present available in standard square and rectangular solid bits, and in 20 standard styles of welded-tip tools of various sizes for turning, facing, and boring.

**THE TOOL ENGINEER**

## Things We All Know About Lathes, Planer & Shaper Jobs

(BUT SOMETIMES FORGET!)

1—Be sure there are no chips on seating or clamping surfaces of vise, parallels or work.

2—See that tool block works freely and seats properly. Failure to do this may have serious results!

3—Don't hammer side of apron to swivel it. If edge of seating surface is dented or burred, tool box will bind.

4—Don't seat the work with a bang! Tap it into place with a babbitt hammer.

5—Never over-tighten clamps because the work may spring. Look for loose points with a "hammer tap."

6—Don't tighten vise again after seating. It may throw the work out of line.

7—Don't allow a cutting tool to project too far from tool post. "Catch it short" and clamp it tight.

8—Use wrenches of proper size, so as not to round the corners of nuts. The next fellow's wrench may slip and injure him!

9—Use washers with all nuts, and don't use bolts that are too long (they may catch clothing!) nor so short that only a few threads bear the strain.

10—Don't brush chips off a running machine. They get into the ways and destroy the bearings.

11—Don't lean on the machine with a wrench in your hand. It may slide into the moving parts!

12—Don't "heave" cutting tools onto a crowded bench. Damaged tools delay the day the boys come marching home!



THE O K TOOL CO.  
SHELTON,  
CONN.



**SYSTEM**  
OF INSERTED-BLADE METAL CUTTING TOOLS

AUGUST, 1942

## For Better FINISHING

## DE-BURRING

## POLISHING



IN A  
FRACTION  
OF THE TIME

WELDON ROBERTS

## Brightboy

*The Soft Rubber Binder Cushions the Abrasive*

Accuracy and results in finishing, de-burring and polishing operations NOW being achieved with Weldon Roberts BRIGHTBOY by an increasing number of war industries, at a fraction of the time formerly required.

BRIGHTBOY's abrasive, cushioned throughout in resilient rubber, has brought about this quicker method for metal working... often completing in one operation work which formerly required numerous set-ups. On both hand and machine work, BRIGHTBOY's abrasive recedes into the rubber binder, producing an effect different from any other abrasive material. Particularly effective in close tolerance operations, with a minimum loss of dimension.

BRIGHTBOY removes light digs, tool and heat marks; cleans welded and soldered joints; finishes dies and tools; de-burrs light stampings and machined parts.

There is no waste with BRIGHTBOY... every bit is usable. Easy to handle—no special preparations or set-ups necessary.

Available to war industries through mill supply distributors. Ask for the booklet on "Methods and Applications" or write us direct for further information if your dealer cannot supply you. Our representative will be glad to confer with you on your finishing problems and requirements.

**BRIGHTBOY INDUSTRIAL DIVISION**  
WELDON ROBERTS RUBBER CO., Newark, N. J., U. S. A.



WELDON ROBERTS  
**Brightboy**

REG. U.S. PAT. OFF.



## ENGRAVING MACHINE

(H44)

Called the Victory Model and claimed to be best fitted for medium heavy work in industrial engraving, a new engraving machine has been introduced by the Auto Engraver Company, 366 Fifth Avenue, New York.

Letters are engraved from master type furnished with the machine and includes both block and shaded script letters. Designs can be traced from the original drawing on paper or from mas-

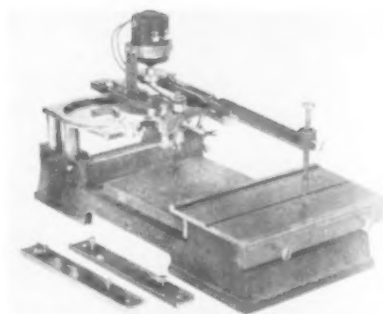
ter templates.

The depth of cut is regulated by micrometer control and the machine engraves on round or flat surfaces. Accuracy and increased production are said to be achieved because both the article and type face the operator and are visible at all times.

## JOINING TIPS TO TOOLS

(H45)

Said to be an improved method of joining carbide and all other types of



**Victory Model Engraver**  
Micrometer control regulates cut.

cutting tips and cutting blades to tool shanks, this new process developed by Krembs and Company, 669 West Ohio Street, Chicago, comprises a special "Fluxined-Spelter" which is used to brush onto the contacting surfaces of both the cutting tip and the tool shank.

The work is then assembled to form a tight fit and brazed. The plan is said



### OPERATION

Drill and tap 5/16—  
18 thread lock screw  
hole in shell nose.  
Two Position Sliding Fixture.

*Tomorrow*

When peacetime requirements are again first—this AVEY drilling machine—because it is standard design—retains the place for which it was originally intended — YOUR PRODUCTION LINE — certainly a wise investment — this AVEY drilling machine that will do TODAY'S JOB and TOMORROW'S JOB.

Because this AVEY DRILLING MACHINE is standard design—your order will receive better delivery.

**THE AVEY DRILLING MACHINE CO.**  
**CINCINNATI • OHIO**

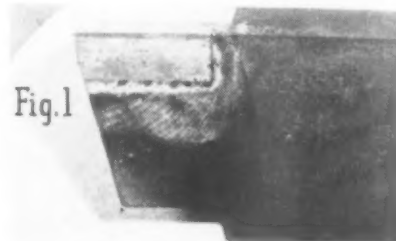


Fig.1

Fig.2

**Krembs' New Joining Method**  
Has a special "Fluxined Spelter".

to be adapted to both small and large scale production and can be used with furnace, torch, or spot welding methods. It is claimed that 100% bonds are obtained from this method.

Figure 1 in the illustration shows the assembly just as it comes out of the brazing oven and indicates the small amount of flux scale left on the work. Figure 2 indicates the same piece after the flux scale has been removed.

## PLOMB BOB

(H46)

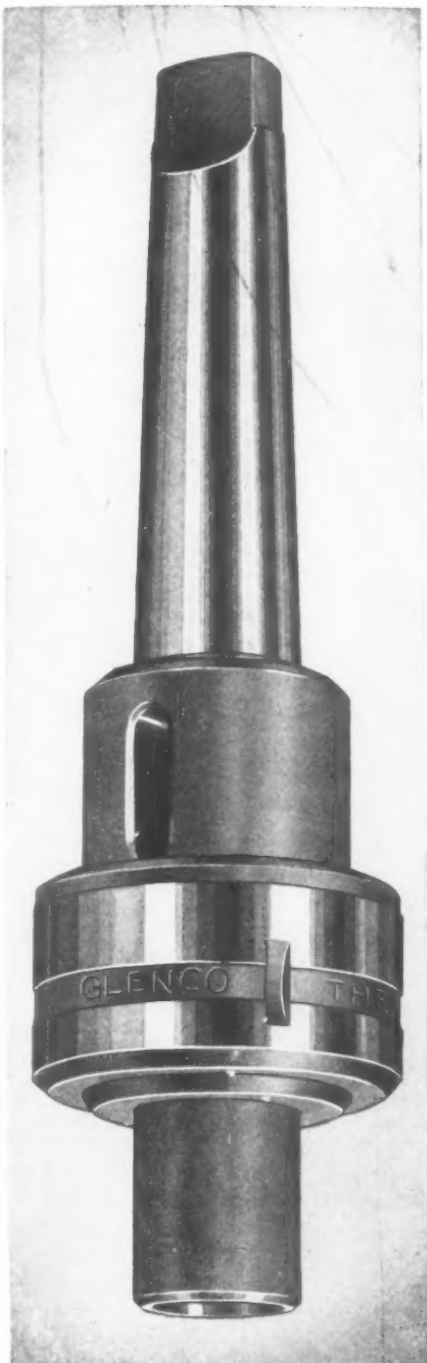
Said to be particularly adaptable to armament and jig installations, as well as other operations where precision alignment is necessary, a new precision plumb bob which features a novel use of phonograph needles has been announced by the Aero Tool Company,

**THE TOOL ENGINEER**

# GLENCO

## FLOATING TOOLHOLDER

*Corrects Machine Tool Misalignment By  
Producing TRUE and ACCURATE Holes*



Also Manufacturers of

**Utility  
Tools**

FLOATING  
HOLDERS  
SPOTFACERS  
COUNTERSINKS

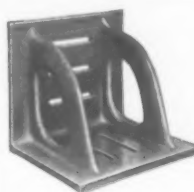
REAMERS  
COUNTERBORERS  
LIVE CENTERS  
SLEEVES  
TAP CHUCKS  
DRILL CHUCKS  
ADJUSTABLE  
ADAPTERS

ADJUSTABLE  
EXTENSION  
ASSEMBLIES  
QUICK CHANGE CHUCKS  
EXTENSION SOCKETS  
SPACING COLLARS  
ARBORS  
END MILLS  
WOODRUFF CUTTERS  
CORE DRILLS

**THE J. C. GLENZER CO.**

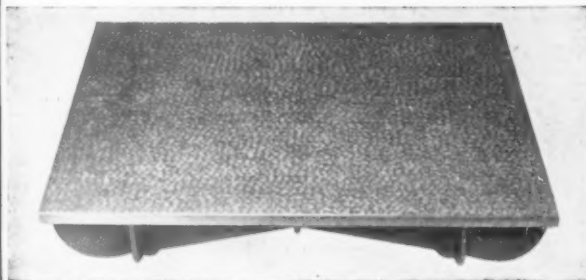
DETROIT

MICHIGAN



*Precision*

## SURFACE PLATES and ANGLES



Designed for accurate and dependable inspection. Both plates and angles are made of Meehanite iron, recognized for its unusually uniform grain structure which assures a smooth, flawless surface.

**PLATES** show no distortion and resist deflection under reasonable load. They have a distinctive form of ribbing which assures flatness on which inspections can be conducted with absolute reliability. These plates can be furnished with steel fabricated stands. Prices quoted on request. Available in sizes from 10 x 15 in. to 6 x 14 ft.

**ANGLES**—designed with high safety factor—exceptionally easy to handle—require less man power. Many sizes and shapes.

*Send for new folder giving full information, sizes and prices of the above items, together with cubes, measuring angles, (made of Meehanite) and wheels, knobs, handles, (cast).*

## MACHINE PRODUCTS CORPORATION

6775 EAST McNICHOLS RD.

DETROIT, MICH.

231 West Olive Avenue, Burbank, California.

The needle is held by a watchmaker's pin chuck at the indicating end and is said by the manufacturer to assure a true and constantly sharp point. The upper part of the bob is threaded into the lower and three bearing surfaces between these parts hold them absolutely concentric. By rotating one part upon the other, it is possible to raise or lower the indicating point over  $\frac{1}{2}$  inch without losing concentricity. This adjust-

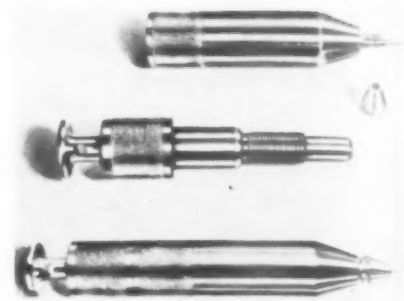
ment feature is said to be important in the aligning of gunsights and other armament installations.

### GRINDING WHEELS

(H47)

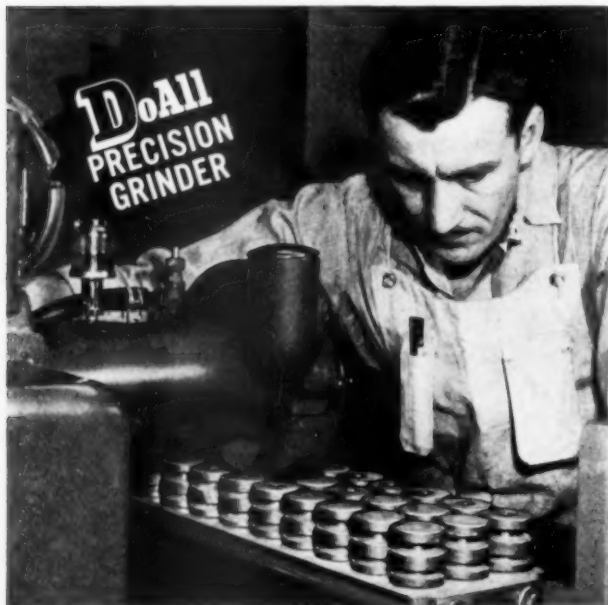
Naming their new product Saftoid, research engineers of the Safety Grinding Wheel & Machine Company, Springfield, Ohio, have developed a substitute for rubber in the manufacture of regulating wheels for centerless grinders.

It is claimed that this new discovery



**Aero Tool's Plomb Bob**  
Even uses phonograph needles.

will alleviate one of the production problems in the machine tool industry which uses thousands of these hard rubber feed wheels for centerless grinders. It is said that they cost less and last longer than the same wheels made of rubber.



Surface grinding Plug Gauges, showing use of coolant.

## A "NATURAL" IN WAR WORK PLANTS

- Read what the Plant Manager of one large mid-west factory writes:

"Recently we installed one of your Surface Grinders. It has been operating on a 24-hour-a-day basis, grinding intricate and precise parts used on gun mounts and pumps.

"It is producing the finest work of all our grinders, both as to surface finish and accuracy. Production on the DoAll is **double that of any similar grinder we have.**"



The DoAll comes in two sizes, adaptable to wet or dry grinding, with 7" or 10" wheel.

Send for literature giving construction features and other interesting data about these better grinders.

**SAVAGE TOOL CO.**  
Dept. TE, Savage, Minn.

### 6 REASONS WHY THIS GRINDER IS THE BEST



**New Material for Regulating Wheels**  
Saftoid substitutes for rubber.

### ENGRAVING TOOL

(H48)

Known as the "Vibro-Tool," a new tool that will engrave, cut, slice, carve, and hammer on steel and other materials has been developed by the Handicraft Division of the Burgess Battery Company, 180 North Wabash Avenue, Chicago. Used, among other things, for putting identifying marks on tools, dies, jigs, and production parts in process, this tool vibrates at the rate of 120 vertical strokes per second, accomplishing its work in this way, instead of using the rotary or grinding method.

Weighing only a pound, one uses the Vibro-Tool just as one uses a pencil. It will plug into any 110 Volt AC line and it is claimed that no skill is required to use it.

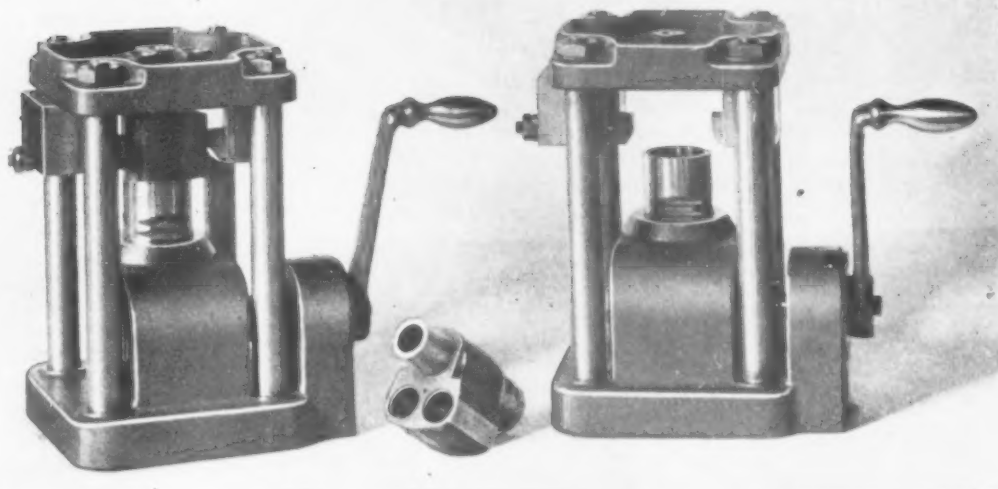
For terms used in materials testing, turn to this month's Data Sheets on pages 97 and 98.



# Fast! Accurate! Positive!

## SIEWEK DRILL JIGS

Accurate drilling of this Diesel engine part shown was accomplished through the use of the SIEWEK DRILL JIG.



Cut time in loading and unloading! SIEWEK DRILL JIGS are faster, more accurate, and give positive results!

WRITE TODAY FOR DESCRIPTIVE CATALOG

### SIEWEK TOOL COMPANY

FERNDAL, MICHIGAN, U.S.A.

## The LOMBARD DIAL GAUGE

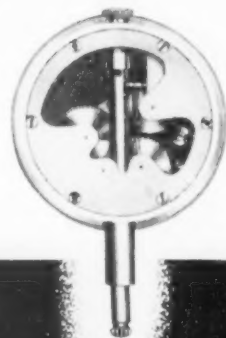
### A Production Instrument

### for ACCURATE REPEAT READINGS

Maintaining the high quality standard of Lombard Governor manufacture, this "A" type Dial Indicator is ruggedly constructed to "stand the gaff" of continued repeat readings. It is a particularly desirable instrument for permanent mounting to machine tools and for production, assembly or inspection applications. Stainless steel spindle. Brass gears and casings. 2" diameter dial turns to set zero to pointer position. Bezel clamp locks securely. Lug back standard; plain back for clamping on bushing furnished if desired.

Instantaneous readings in tenths, or thousandths, as desired. Also "Junior" size; mounts and clamps. The services of our experienced engineering staff are gladly offered to work out application of these superior instruments to your particular requirements.

The cutaway view at right shows gear arrangement and rigid construction obtained by use of solid front and back plates applied directly to case. This method of assembly entirely eliminates the need for dowels and assures longer gauge life and accurate repeat readings.



## LOMBARD GOVERNOR CORPORATION

100 MAIN ST. ASHLAND, MASS. U. S. A.

## Handy Andy Says



ONE negative trait of us humans is that we're inclined to take our friends for granted, like a man after he's married, and vice versa, which is why a lot of people go to Reno to rub

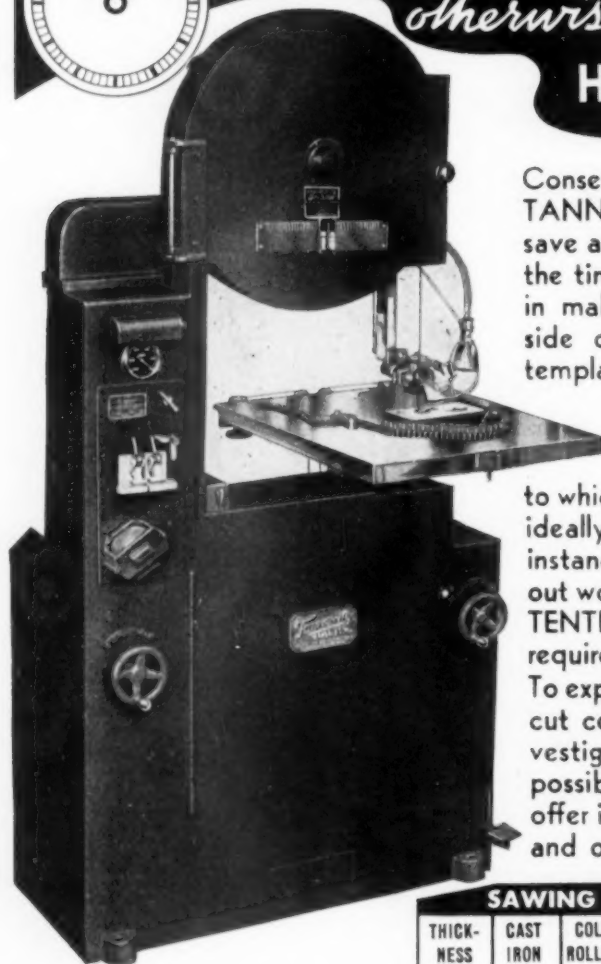
out marital mistakes. Or, when they go West, we chip in for flowers and eulogize the departed, all of which is very sentimental but doesn't get the departed anything. Me, I believe in spreading the cheer while my friends can enjoy it, by token of which I got a big kick out of a send-off given a retiring Midland Steel foreman a few days ago. Ed Maples, his name is, and Ed has been a mainspring in the tool shop these many years. Now, approaching the allotted three score and ten, he wants to bask in the sunset glow, taking a richly earned vacation. The boys got together—the Tool Shop, the Engineering, Man-

agement and all his Friends, to capitalize all—and presented him with a fine motor boat as well as fishing tackle and all the paraphernalia for piscatorial enjoyment, including a can of peas which is Wally Herman's favorite bait. Incidentally, Wally (he's Tool Room Sup't) made the presentation speech and put it over in grand style, having practised all morning in one of the welding booths. Now, I want to add my bit, giving a Grand Old Man something to remember me by. To Ed Maples, toolmaker par excellence, a foreman beloved by all and a friend whom I have been proud to have known, Au Revoir. Be as you were, and may the fishing be good.

## TANNEWITZ DI-SAWS



*Do in MINUTES jobs which  
otherwise require  
HOURS!*



Conservatively estimated TANNEWITZ DI-SAWS save an average of 70% of the time and cost involved in making inside and outside cuts on dies, shoes, templates and the hundreds of other operations, including filing and polishing, to which these machines are ideally adaptable. In many instances they are turning out work in as little as ONE-TENTH of the former time required.

To expedite production and cut costs, by all means investigate the tremendous possibilities these machines offer in tool and die making and other applications.

The popularity of DI-SAWING is growing by leaps and bounds. Get the complete facts on the most highly developed DI-SAW on the market. Simply write for our DI-SAW Bulletin.

### SAWING SPEEDS PER MINUTE

THICK- NESS	CAST IRON	GOLD ROLLED	TOOL STEEL	HI SPEED STEEL	HI CHROME HI CARBON
1/4"	16"	9"	5"	2 3/8"	1 1/2"
1/2"	8"	4 1/2"	2 1/2"	1 1/8"	3/4"
1"	3 1/2"	2 1/4"	1 1/4"	1/2"	3/8"
1 1/2"	2"	1"	3/4"	5/16"	3/16"
3"	1"	1/2"	5/16"	5/32"	3/32"
6"	1/2"	1/4"	5/32"	5/64"	1/32"

*Made by Sawing Machinery Specialists*

**THE TANNEWITZ WORKS, GRAND RAPIDS, MICH.**

Y'know, I sometimes wish that these high pressure executives would let a fellow sleep come Sunday morn. But Otto Winter, who commutes between Chi and Detroit since his ascension to the Chair, has a habit of breezing into town on scant notice and calling a meeting in the middle of the night. Like 10 A. M. Sunday, for instance, and before some of the boys — like this fellow Denham who publicities for us — have had a chance to get outside their ham and eggs. But last meeting before this writing (it was June 28) we ganged up on him and took revenge. After lining up a lot more Regional Vice Chairmen, he wanted someone to head this A.S.T.E. Educational and Training Committee which, as you all know, is his own brain child rechristened. So, we just dumped it right into his own lap, it being his baby in the first place and up to him to bring it up right. Oh sure, Ot kicked the traces some, but we stood pat, it being an axiom of good management that the man best fitted to carry out a job is the one who conceives it. Besides, Ot did a swell job with the Defense Training Program before he became Prex, a job which he is also handling with distinction. Anyway, we made an A.S.T.E. Prex assume dual offices, by virtue of which he rates two Pullmans when going to our Conventions. To him who hath!

Speaking about jobs, this Column will pay good money—i.e., what there is of it will be good—for info as to the whereabouts of one Art Denis, last seen by the writer at the Jefferson Hotel, St. Louis. On that occasion, our energetic friend from sunny California talked himself into a job and it's been chasing him around the country ever since, trying to catch up. Any A.S.T.E. in good standing may apprehend him, when — as aforesaid — the reward will be duly paid on proof of identity. (Adv.) P. S. Since the above was written Art

**BRAEBURN ALLOY  
STEEL CORPORATION**  
(Pittsburgh District)  
BRAEBURN, PA.

# MOCUT

**Moly  
Tungsten  
High Speed Steel**

## Chemical Analysis

Carbon .80	Chromium 4.00	Tungsten 1.55	Molybdenum 8.00	Vanadium 1.10
---------------	------------------	------------------	--------------------	------------------

## Heating Instructions

**FORGING** 1850° F. 1950° F.

Cool slowly after forging.

**ANNEALING** (Brinell 217-235) 1550° F.

## HARDENING

Preheat 1400° F./1450° F.

High Heat 2200° F./2240° F.

Quench in Oil or Air

Draw 1020° F./1150° F.

## Applications

*General purpose High Speed Steel for same applications as Tungsten (18-4-1) High Speed Steels.*

**WRITE FOR LITERATURE**

**BRAEBURN ALLOY STEEL CORP.**

**BRAEBURN, PA.**

# ONE MAN GOT 40,000 HOLES PER TAP

**INSTEAD OF 8,000**

**—AND SO CAN YOU—**

**BY USING A**

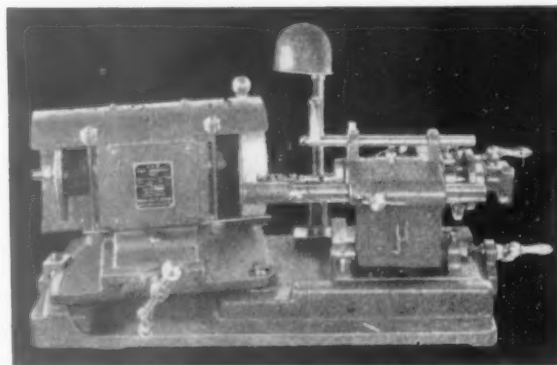
## J-B TAP GRINDER

Why buy new taps when you can get from two to ten times the number of holes from your present stock by keeping them sharp on the J-B TAP GRINDER?

The J-B is saving manufacturers hundreds of dollars by getting full use from every tap. It can do as much for you!

The J-B will grind the chamfer on right- or left-hand taps with 2, 3, 4, 5, 6, 8 and ten flutes. Capacity—No. 0 to 2". It is also ideal for grinding countersinks and other small tools.

Investigate the low cost J-B method by mailing the coupon today!



Please send me complete information on the J-B TAP GRINDER.

NAME \_\_\_\_\_ TITLE \_\_\_\_\_

COMPANY \_\_\_\_\_

STREET \_\_\_\_\_

CITY \_\_\_\_\_ STATE \_\_\_\_\_

T.E.

**MAIL THE COUPON TODAY!!**

**EDWARD BLAKE COMPANY**

634 COMMONWEALTH AVE., NEWTON CENTRE, MASS.

J-B TAP GRINDERS — FILTAIRE PORTABLE DUST COLLECTORS — AMERICAN TOOL HOLDERS — BLACK DIAMOND PRECISION DRILL GRINDERS



has voluntarily surrendered, whereby the reward is automatically cancelled. Thanks just the same.

Heard from Pop Hiatt recently, Pop having been one of the prime movers in organizing Racine Chapter and starting the A.S.T.E. landslide. Now, Pop wants to know if this Crib which THE TOOL ENGINEER has opened up is a bona fide exchange for Tool Engineering ideas and if it is really pays honest-to-gosh U.S. coin for acceptable ideas. Righto, to

both questions, although the disposition of material is at the discretion of the Editorial Committee. However, the Committee is unprejudiced and receptive to good ideas, its function being to separate the wheat from the chaff and to present material in good form. Tool Engineers with vexing production problems may refer them to the Crib, where they will be analyzed and resolved. After all, ten thousand Tool Engineers can't be wrong, and the solution of any tooling problem can be worked out among our members. Ask, and ye shall

receive, but blessed is also he who gives. Therefore, give cheerfully of your ideas (for a consideration) but don't hesitate to ask for advice when needed. It's free but none the less valuable for that.

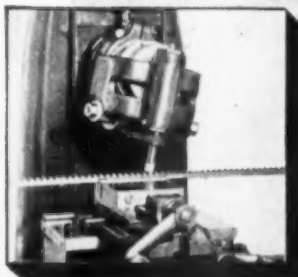
In a roundabout way, I heard that every member of Philadelphia Chapter is listed in the local Who's Who in Engineering, which puts the Quakers right in the cream of high sassiety. Imagine it! And here the rest of us are, blushing unseen and wasting our talents on the desert air, like. But seriously, I think it's a fine idea and should apply to all our Chapters, but with the reservation that mention in a Who's Who should imply an award of merit aside from membership alone, and determined by a selecting committee. Of course, that needn't apply to the Philadelphians, who are different from us *Auslanders* whose impressions of the City of Brotherly Love have been largely shaped by vaudeville gagsters, (will they print that gangsters, I wonder?) from N'York. They're really up-and-coming (the Quakers, I mean) and maybe I'll move to Philly some day so I can be famous too. The way it is, I just keep on getting red in the face and nobody notices it.

Don't get to see the boys much, lately, except vicariously, everybody being busy except myself. But t'other morning, driving to work, I made a red light along with Earl Ruggles of Gemmer Mfg., who honked for attention and thereby created a few seconds pleasant diversion. Rug is looking fine considering the headaches engendered of war conversion, although I imagine that he's equal to any problem in tooling. Also heard from Geo. Keller, come from Buffalo to spend a day in Detroit. Called me up and kept me guessing, the son-of-a-gun, talking French which made me suspect he was somebody from up in the Dominion. Going places, George is, and I'm glad. Had a letter from Doug Burnside, very friendly and pleasant, and greetings from Ray Morris and John Lindegren. Thanks, and many happy returns; be seeing you all before long, in Springfield.

When this reaches you, it will be only about two months to the Semi-Annual in Springfield, and I hear that the Easterners are set to make Milwaukee jealous, so you'd better plan to attend. Me, I'm planning to take a few extra days, a/c wanting to tread the soil of Little Rhody again although it must be some differ-

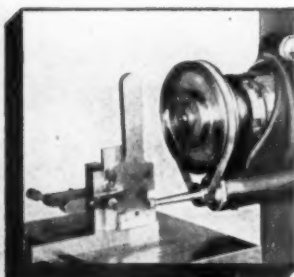
(Continued on page 168)

## LIBERTY High Speed Grinding Attachments

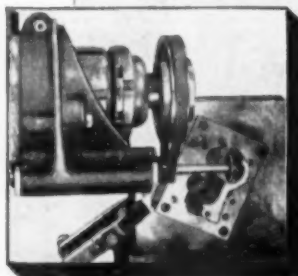


Grinding clearance of broach teeth.

Both horizontal and vertical types are easily attached to most surface grinders for grinding angles, slots, recesses and surfaces which are impossible to reach with large grinding wheels.



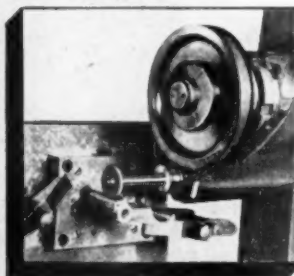
Grinding gage in perfect alignment with other points.



Grinding punch form.

For extremely accurate grinding on gages, tools, dies, etc. Assembled complete with any size bores, pulleys, belts and grinding wheels at no extra cost.

Write for details — specifying diameter of spindle head, type and make of grinder.



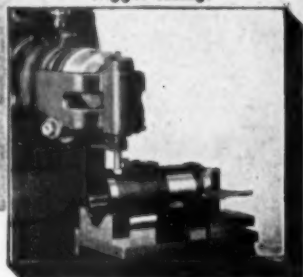
Grinding shoulder on punch.

### LIBERTY TOOL & GAGE WORKS

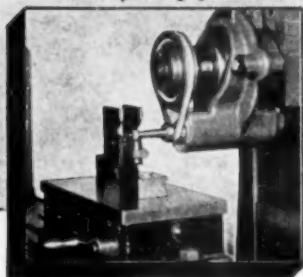
235 Georgia Ave.

Providence, R. I.

Grinding rectangular opening in trigger casing.



Grinding gaging seat on special gage.



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Available for immediate shipment in two grades of "Tamaloy," a new Tungsten Carbide, Circle Tip standard tools are finished ground, ready for use, or may be reground to meet your particular cutting problems.

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HIGH RESISTANCE TO ABRASION

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CATALOG AND PRICES ON REQUEST

**The CIRCLE TIP TOOL COMPANY Inc., EAST ORANGE, N.J.**

# A. S. T. E. DOINGS . . . . .



## Boston

The Boston Chapter had their annual "Fun-Nite" June 18th at the Hotel Lenox. This meeting was intended to be held as in previous years at Sandy Burr, but because of gas rationing and tires the meeting this year was held right in Boston. This meeting drew a very large number of members and guests, including several army officers.

## Fond du Lac

Visitors and guests from industrial plants within the Sheboygan area, were entertained Friday evening, July 10th, by the Fond du Lac Chapter. This meeting was held at the Pine Hills Country Club, Sheboygan.

After the business session, Chairman K. F. Gallimore turned the meeting over to the main speaker, Mr. A. W. Weise of the Marlin-Rockwell Corporation, Chicago. The speaker's discussion dealt with "Manufacturing Methods used in the Production of Ball Bearings and Bearing Applications." Mr. Weise concluded the activities of the evening by showing an interesting color film taken on his vacation, "Glimpses of Guatemala."

Out of town members who visited this meeting included Mr. Eugene Bouton and Mr. William Iekel. All arrangements for this meeting were made by Mr. William Felten of the Vollrath Company, Sheboygan. The next Chapter meeting will be held Sunday, August 16th, at the Takodah Club, Fond du Lac. This will be a social gathering, afternoon and evening.

## Indianapolis

The annual summer outing of the Indianapolis Chapter was held Saturday June 20th, at the Lake Shore Country Club. Mr. Herman Planker was chairman in charge of arrangements and was assisted by chairman J. H. Hopwood, vice-chairman H. R. Shearer, treasurer H. L. Boese and secretary C. M. Wetzel. About 75 people attended this outing and took part in golf, horseshoes, shuffleboard and fishing. A Dutch lunch was served from noon until 8 P.M. and many prizes were given for golf and attendance.

## Los Angeles

The regular monthly dinner meeting of the Los Angeles Chapter was held on July 9th at Scully's Cafe.

First guest speaker of the evening

## Springfield Chapter Has a Clambake



Pictured above are several of the members who attended the Springfield Clambake, all active in arranging the October War Production Conference of the A.S.T.E. at Springfield. Left to right: Frank W. Curtis, convention chairman; Carl Rising, Springfield, first vice-chairman; Ed. Sheldon, chairman; Michael Brennan; Kenneth Abbe, second vice-chairman; and Ray Morris, first vice-president of the A.S.T.E.

was Mr. Cyril P. Hubert, Chief Loftsmen of the California Shipbuilding Corp. He gave a very interesting talk on "Lofting or Fairing the Lines of a Vessel."

Second guest speaker of the evening was Mr. H. J. Torosian, mechanical engineer also of the California Shipbuilding Corporation, who spoke on "Shell Plate Edge Preparation by the Utilization of Mechanical Cams." Approximately 300 members and guests attended this meeting.

## Rochester

The Rochester Chapter held its 5th annual picnic at Point Pleasant on Saturday afternoon, June 20th. With the numerous operating shifts now employed in various industrial plants, an arrangement was made whereby dinner would be served at 2, 4, as well as 6 P.M. This plan was very satisfactory and a total of 189 attended this get-together.

Herb Simon of the Rochester Products Division of General Motors was chairman. Those assisting him included Jerry Sick, Joe Schick, Cliff Sears, and Jake Phillippsen.

## San Diego

One hundred or more members of the San Diego chapter attended this monthly meeting, on the evening of June 26, at the El Cortez Hotel. After dinner

two movie shorts titled "Building the Record Breaker PBY" and "The Messerschmitt 110" were presented.

A note from Mr. A. C. Barlow of the San Diego Chapter says, "Keen interest

## At Rochester Picnic



Left: Cliff Sears, Chapter chairman. Right: Herb Simon, Picnic chairman.

was aroused when it became obvious that the Nazis, have spared no effort, nor shown any lack of ingenuity in designing and building their aircraft. Common stories declaring that airplanes are crates about to fall apart are definitely not true. Tooling must have played a great part in initial design and subsequent fabrication of the "110" as it was noted that all parts and assemblies were of a type which readily lend themselves to mass production with a minimum of skilled labor. These revelations had a good effect in awakening a new deter-



mination amongst those present."

"It was heartening to proudly witness the movie film at the Consolidated Aircraft Company's plant in San Diego. The methodical and dogged determination of our engineers to incorporate good principles and materials has proven such practices to be superior to all comers. Get the pictures and see what we mean."

Among other business transacted during the business meeting was the nomination of R. E. Oversmith and Arthur Nordstrom as representatives to attend the annual convention. A correspondence course will soon be offered in Tool Engineering. Mr. Wooster of San Diego conceived this idea and is justly elated with the manner in which it has been accepted.

### Seattle

The Seattle Chapter held its June 9th meeting at Crawford's Sea Grill with 70 Tool Engineers and 15 guests present.

The speaker of the evening was Prof. Gilbert S. Schaller, of the University of Washington, Dept. of Engineering, who gave a very interesting talk on the development of aluminum. Also on the program was a film entitled "Unfinished Rainbows," presented by the Aluminum Company of America.

Following this technical session, a brief business meeting was held.

### Springfield

The third annual clambake and outing of the Springfield Chapter was held at Turner Park, Springfield, Saturday, June 13th. Over 200 were present.

After partaking of a lunch and the usual refreshments, the members took part in horse-shoe pitching, golf driving and baseball. This get-together was under the supervision of Mr. Charles Stonerod, chairman of the entertainment committee. The party was said to be unusually successful and many prizes were donated which added interest to the occasion.

### San Francisco and Oakland (Golden Gate Chapter)

The Golden Gate Chapter held its regular monthly meeting at the Engineer's Club in San Francisco on June 17th and was attended by 82 members and guests.

Following dinner, Chairman Kassebohm introduced Mr. E. E. Hayden of the DuPont Company who gave a short preliminary talk on the sound technical picture titled "Three Dimensional Finishing of Machine Tools."

The picture brought forth the experiments done by the DuPont Company for improving the painting of machines from the traditional dull gray, using a light color near the tool area and a darker shade for the remainder of the

machine. The color change not only provided more light and better sight, but was instrumental in improving production and reducing accidents.

For the technical session the principal speaker of the evening was Prof. Paul E. DeGarmo, of the University of California, who presented a paper titled "Increasing the Output with Motion Economy." This was a very timely paper analyzing the problems of time and motion study as related to Tool Engineering. He also discussed, at very great length, the definite relation between motion economy and efficiency of tool output in manufacturing.

### Toronto

The June meeting of the Toronto Chapter was held on Friday, June 26th, in the form of a Golf and Sports Day at the Western Golf and Country Club in Toronto.

159 people sat down to dinner, and after dinner, prizes were distributed for horse-shoe, baseball and golf. The low gross for the day in golf was won by Mr. Tuttle, and the Toronto Chapter trophy was won by the Secretary Mr. L. Singer, in the members only competition.

Mr. Silborn and Mr. Briden took the honors in horse-shoes.

### ELECTION OF REGIONAL DIRECTORS

Official Ballots are in the mails, being sent to the members in ten of the Regions privileged to elect, in each case,

a Director to serve for two years from October 1, 1942. Directors from the other ten Regions have another year to serve until October 1, 1943. Although ballots are being mailed to all members of record in the given Regions, only those votes will count which come from paid up members. Ballots received from delinquents will not be counted. Completed ballots must be returned to National Headquarters prior to Midnight August 15. The newly-elected Directors will be certified on September 15 and will take office on October 1, 1942. They and the present Regional Directors, twenty in all, will meet at Springfield, Massachusetts, at the War Production Conference, the Semi-Annual Meeting of A.S.T.E., October 16-17. Regions which will elect Directors and those nominated are as follows:

REGION 3. Southern Connecticut and Little Rhody — Fred J. Dawless, Harold Rayner

REGION 6. Philadelphia, Baltimore, and Potomac — Paul Frankfurter, Sr., John A. McMonagle.

REGION 10. Cincinnati, Dayton and Columbus — W. J. Frederick, Arthur C. Pletz

REGION 12. Indianapolis and South Bend — Walter Ringling, Horace Wentzell

REGION 13. Chicago, Twin Cities and Rockford — E. W. Dickett, George C. Johnson

REGION 16. Nashville and Louisville — T. J. Moulten, H. T. Sprott

### INFORMATION WANTED

On page 80 is the story of two antiquated machine tools which are doing excellent service in this effort to develop maximum production of war materiel. Undoubtedly, there are other machine tools which have been taken from scrap piles or dark corners, cleaned up a bit, repaired, and again put into service.

We would like to secure information concerning this equipment. It will be appreciated if each member of the American Society of Tool Engineers will report such machine tools to me. We need to know the name of the manufacturer, the approximate date when the machine was first put into use, what type of operation is now being performed on it and any other historical background you can develop. Of course, a glossy-print photograph of the machine will help a lot. We feel that there are probably many veteran machines, worn out and obsolete, which have been called back into service and are doing a real production job.

Incidentally, if you can give us any specific information on the dates of manufacture of the machines pictured this month, we'd like to have it.

Will you co-operate by getting this information to us?

Mail it to:

Joseph A. Siegel, Chairman  
National Publicity Committee  
American Society of Tool Engineers  
2567 West Grand Boulevard  
Detroit, Michigan



**DUBLIFE**  
PLUG GAGES LAST TWICE AS LONG  
AS ORDINARY GAGES

**"UPPCO FINISH"**  
ASSURES EXTREME HARDNESS  
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**ORIGINATORS**  
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The handle is made of hexagon material with bronze tapered collet which locks around the plug as it is driven into the handle. The plug are reversible, so that when one end is worn out the other end may be used, thus giving double life. 30,000 gages in stock ranging from .030" to 1".

Catalog showing DUBLIFE and other gages of American Gage design will be sent on request.

## MASS PRODUCTION OF WELDED PIECES

Where quantities of similar pieces are to be welded, time savings range up to 50% and beyond when Ransome Positioners are used.

The T-slotted table top is first jigged-up and the welder is then prepared to weld one piece after another with little lost time in changing pieces, less rod waste, better welds and more production. Write for complete information.



**INDUSTRIAL DIVISION**  
**RANSOME CONCRETE MACHINERY COMPANY**  
DUNELLEN NEW JERSEY

### —A.S.T.E. DOINGS—

REGION 17. Houston, North Texas and Wichita — Floyd Doty, L. M. Cole  
REGION 18. San Diego and Los Angeles—William Asmus, James Meers, Harold Keswick  
REGION 19. Golden Gate and Seattle — Karl Bues, Walter Kassebohm  
REGION 20. Toronto, Hamilton and Montreal — Leonard G. Singer, Edgar Barker.

### CHIPS FROM ASTE NATIONAL HEADQUARTERS

*Space permitting, this column will appear monthly in THE TOOL ENGINEER. Even chips from your machines have value today and it is our hope that these chips will be of value to many members of A.S.T.E. and particularly to Chapter Officers and Committeemen. We shall appreciate your comments.*

Arthur A. Schwartz, Bell Aircraft Corporation, a member of Buffalo Chapter, and P. W. Brown, of Wright Aeronautical, who belongs to Northern New Jersey Chapter, found themselves in print in the July 11 issue of *Collier's*. Kyle Crichton had a story, "Leave It To Joe". If you have not seen it, look it over. You'll be interested to find that a few of the many really great things done by A.S.T.E.'rs are coming to the light of day. Congratulations Art and Bill! Keep up the good work.

While we are thinking in terms of other periodicals than our own, we find another Tool Engineer mentioned in the public prints. This time it is in the *Saturday Evening Post* of June 20, where, in an editorial entitled "Free Enterprise Paved The Way For War Production," it was said, "Whatever the modifications of our system the war will inevitably bring about, it will do no harm to remember that, even in the midst of a war which deals with men in the mass, we owe something to the individualistic, crotchety, creative, un-reconstructed Blue Chip Haggertys who set up the machines and devices upon which we are able to call for the protean feats in production which now dazzle us and will eventually defeat the Axis." We are unable to find any Blue Chip Haggerty in our membership list. Will someone please sign him up?

Speaking of members—at the close of business, June 30, 1942, the American Society of Tool Engineers included 10,530 members.

The Executive Committee met in Detroit on May 3 and again on July 12. They were day-long sessions of about ten hours. These sessions at National Headquarters are all business. Much of real value is being accomplished as will be proven by subsequent announcements.

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*Consulting Tool Engineer*

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AVAILABLE HOURS  
PER WEEK FOR  
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**NO MORE** OVERSIZED OR  
BELL-MOUTHED **HOLES**  
— IN TAPPING and REAMING —



Furnished with male or female taper, straight, threaded or special shanks to fit any machine used for tapping or reaming.

## The Tool Holder That Always Floats!

**P**UT AN END to the scrapping of valuable parts caused by faulty tapping and reaming. Equip your machines with Ziegler "Roller-Drive" Tool Holders and see how your production will jump. It's a holder that always floats—regardless of spindle misalignment—and regardless of how severe the tool-driving strain.

No other tool holder has the floating-action of the Ziegler. Never any friction or cramping, no matter how heavy the load! No wonder it turns out work accurately to the finest of tolerances! Get the low-down! Send today for detailed information.

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**FLOATING HOLDER**  
for Taps and Reamers...



# NEW LITERATURE . . . . .

Of Interest to the Tool Engineer



## (460) Lead Checker

*The New 1205 "Sine-Line" Gear Lead Checker.* Michigan Tool Company, 7171 East McNichols Road, Detroit. This new bulletin gives information covering the "Sine-Line" method of operation, dimensions, and other data for the machine, which is said to be capable of

measuring gear leads from zero to infinity. Illustrations of this new unit are shown, including several views of the operating mechanism, and a table of specifications.

## (461) Dies

*Carboloy Cartridge Case Die.* 12 pp.

Carboloy Company, Inc., Detroit. Covering standardized Carboloy dies for small arms ammunition, this new booklet gives specifications on die sizes for .30 and .50 armor piercing jackets, tracer and ball jackets, and cartridge cases. The manual also has an operator training section covering the finishing and servicing of carbide dies. Also included are details on equipment required.

## (462) Transmissions

*Drive-All System of Individual Motor Drives.* 8 pp. Drive-All Manufacturing Company, 3400 Conner Avenue, Detroit. This new catalog describes a simplified technique of mounting individual motorized units with standardized brackets on any type of machine tool. It points out claimed advantages of individual motorizing of belt driven machines from the standpoints of economy, production increase, and shop flexibility. Included are illustrations of applications and engineering data.

## (463) Hob Sharpening

*The Right and Wrong of Hob Sharpening.* 28 pp. Illinois Tool Works, 2501 North Keeler Avenue, Chicago. This is a first of a series of technical bulletins to be released and endeavors to help all hob users secure better gears without unnecessary waste. Featuring the use of hobs and the sharpening problems involved in the grinding, this bulletin is fully illustrated.

## (464) Pneumatic Cylinders

*Hannifin Pneumatic Cylinders.* 52 pp. Hannifin Manufacturing Company, 621-631 South Kolmar Avenue, Chicago. Featuring pneumatic cylinders of all types and sizes, this catalog illustrates each model and its specifications. Hydraulic cylinders, air control valves, and pressure regulators are also listed and illustrated.

## (465) Electric Motors

*Lima Electric Motors.* The Lima Electric Motor Company, Lima, Ohio. This folder is a series of bulletins, price lists, and specifications on electric motors, gearshift drives, and gear head motors. Completely illustrated, it shows many line diagrams of the motors and drives.

## (466) Driller or Tapper

*Natco High Speed Sensitive Multi-Driller or Tapper.* 24 pp. The National

*1/39 the thickness of a dollar bill*

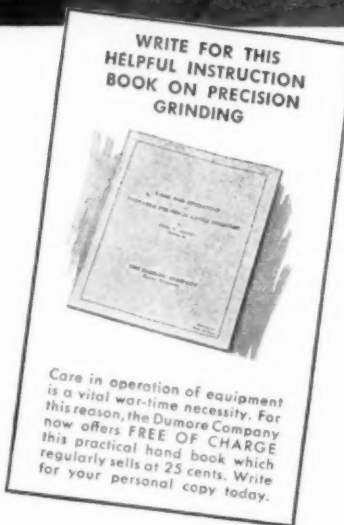
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WITH A DUMORE



Unusual applications of Dumore Precision Grinders are daily occurrences in tool rooms and machine shops. Here, for instance, a Dumore No. 77 with external quill is grinding down a heavy duty clutch face. Flexibility, plus delicately controlled accuracy... to .0001"... is responsible for surprising savings in labor costs... elimination of delays and reduction of spoilage on grinding jobs, internal and external. Mount Dumore Grinders on lathes, shapers, milling machines, or other machine tools... modernize your old machinery... increase the efficiency of your new equipment. Whether your grinding problem is a delicate finishing operation or heavy hogging work, there is a Dumore Precision Grinder to fit your needs. Get all the facts at once. Call the Dumore Industrial Distributor in your city or write, today.



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# Dumore PRECISION Grinders

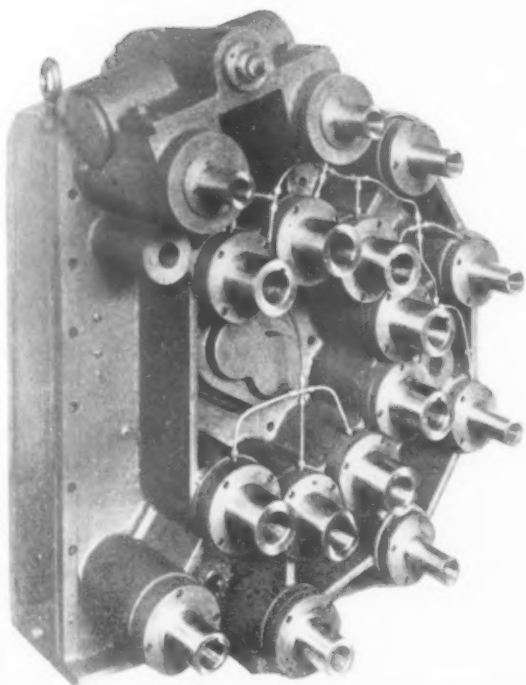
THE TOOL ENGINEER

**Buhr**

## MULTIPLE PRODUCTION DRILL HEADS

*Help You*

### GET THE MOST OUT OF THE MACHINES YOU HAVE



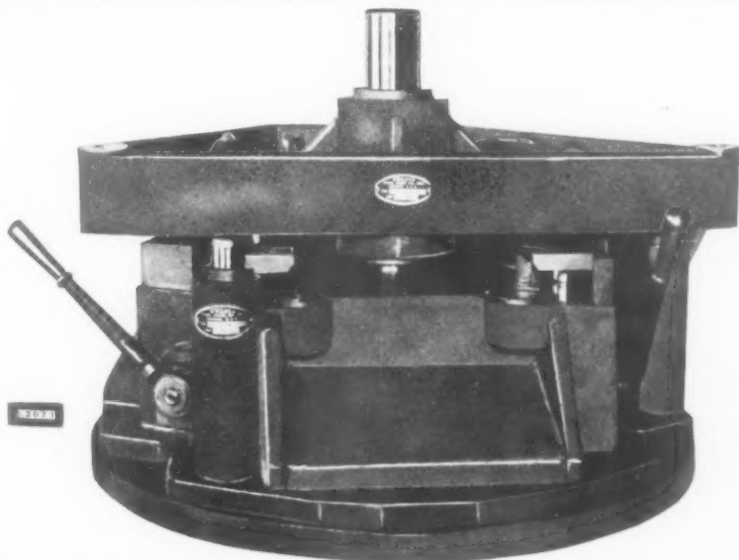
Sixteen-spindle Buhr Drilling, Counterboring, Facing and Reaming Head, designed for the left-hand head of a 2-way Machine. Vertical adjustment. Two top spindles are accelerated to give three times the feed of the other spindles. Oil pump provides positive lubrication.

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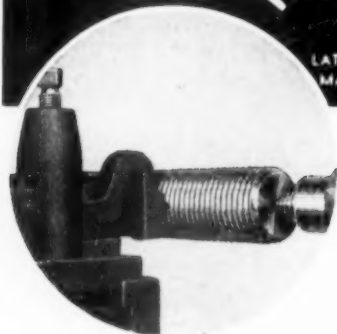
Cleveland—J. W. Mull, Jr.  
Indianapolis—J. W. Mull, Jr.  
Milwaukee—Geo. M. Wolff, Inc.  
Houston—Engineering Sales Co.

Chicago—Ernie Johnson  
Canada—Hi-Speed Tools, Ltd., Galt, Ont.  
St. Louis—Mill Supply & Mach. Co.  
Beverly Hills, Cal.—Criterion Tool Sales  
Oneida, N. Y.—W. F. Himmelsbach

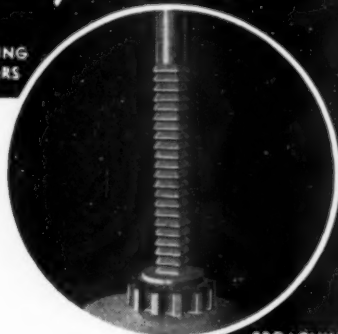
Pittsburgh—J. W. Mull, Jr.  
Toledo—J. W. Mull, Jr.  
Philadelphia, Pa.—Morgan Tool  
& Equipment Co.

# CMD CENTER POINT LUBRICANTS

## *For Lubricating Centers*



LATHE AND MILLING  
MACHINE CENTERS

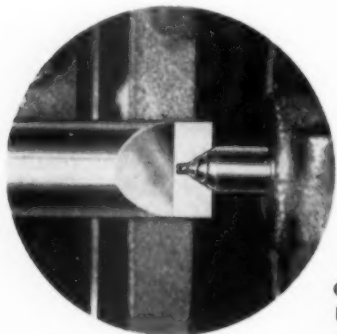


BROACHING —  
EXTRUDING —  
TAPPING

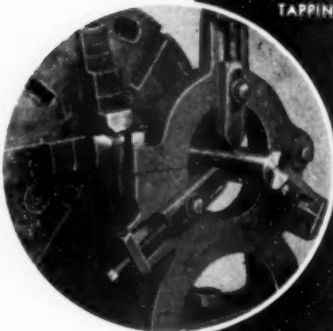
The Illustrations Indicate Various Applications for CMD Center Point Lubricants—A test in your plant will prove the superiority of CMD Lubricants for the troublesome problem of mechanical lubrication of lathes, grinder, etc., centers—HERE IS WHY:

It is economical because only one application is necessary. No lost time in stopping lathe to re-lubricate. Precision work assured. Galling and burning of lathe centers reduced, not affected by work expansion. No readjustment of tail stock—and a very important factor is the reduction of power, because when work expands, pressures are exerted on tail stock and lathe head, creating a thrust load.

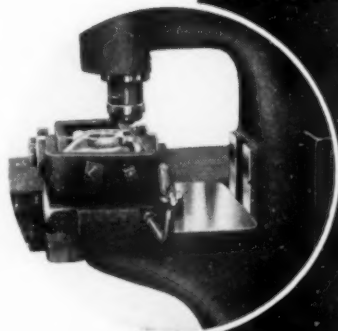
CMD LATHE CENTER POINT LUBRICANTS may be had in two consistencies. CMD LATHE CENTER POINT OIL is in liquid form, and CMD LATHE CENTER POINT LUBE having the consistency of No. 3 grease...available in sizes from 1 qt. to 30 gal.—also in 4 oz. collapsible tubes.



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MACHINE  
CENTERS



STEADY RESTS —  
HEAVY JOURNALS



RIVET SPINNING —  
CAMS — SCREW  
MACHINE PARTS

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*Sample Kit*

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Gentlemen:

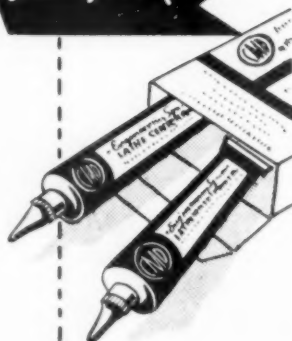
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162



## —NEW LITERATURE—

Automatic Tool Company, Richmond, Indiana. Models G-5 and G-6 are described and illustrated in this catalog. Specific examples of multi-drilling and tapping work done on these machines are given and tell the specifications and setup time of each job.

### (467) Drill Grinding

*Perfect Grinding of All Drills.* 4 pp. Industrial Engineering Company, Inc., Minneapolis, Minn. Describing a new grinding fixture made in three sizes, this folder gives the specifications and shows how the fixture is attached to the grinder. Price quotations are also given.

### (468) Dust Control

*AFF in Industry.* 32 pp. American Air Filter Company, Inc., Louisville, Ky. Discussing industrial dust problems in general, this booklet emphasizes the importance of filtered air for drying operations, for product finishing, and for control of process dust. It has many illustrations and line drawings of typical setups.

### (469) Broaching Machines

*Universal Horizontal Broaching Machines.* 12 pp. Colonial Broach Company, Detroit. This folder covers the features of the 12 machines that constitute the standard line. Included among the features are the large face plate, the motor and pump mounting, and the hydraulic system. Descriptions of typical applications of horizontal broaching, complete specification tables for dimensions of the various machines, and data on equipment available for special broaching operations are included in the folder. Information and tables on broach drive heads, roller follow rests, and chip troughs are given.

### (470) Coolant Pumps

*Gusher Coolant Pumps.* 8 pp. The Ruthman Machinery Company, Cincinnati, Ohio. This folder illustrates the entire Gusher line of coolant pumps in various sizes ranging from 1/30 to 2 hp. Completely described are the immersed types, flange mounted types, tank units, and plain drive types.

### (471) Cutting Tools

*Kennametal Steel and Metal Cutting Tools and Blanks.* The McKenna Metals Company, 600 Lloyd Avenue, Latrobe, Pa. This new catalog contains both line drawings and halftone illustrations of each standard type Kennametal tool. Line drawings also illustrate typical applications of each type of tool. Pages are devoted to the selection and design of tools and blanks, chip breaker designs, correct grinding, bor-

THE TOOL ENGINEER



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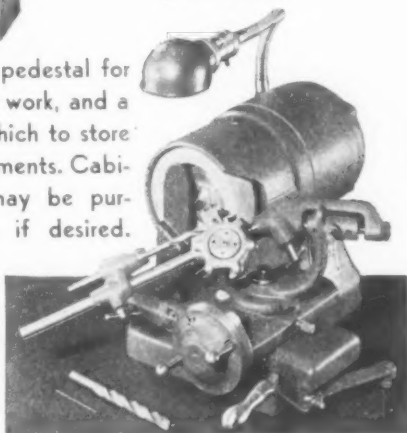


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AUGUST, 1942

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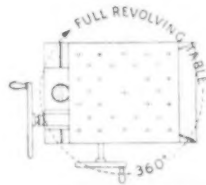
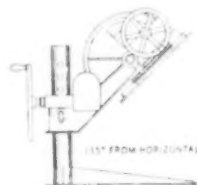
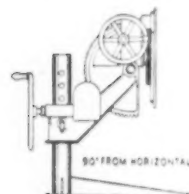
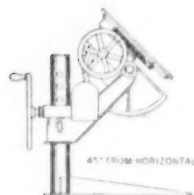
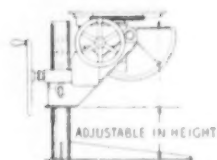
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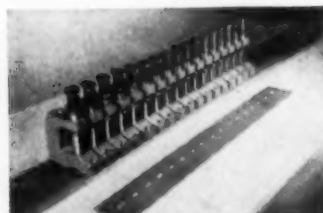


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Die setting time is reduced from hours to minutes by Wales patented holder which keeps punches and dies always in perfect alignment.

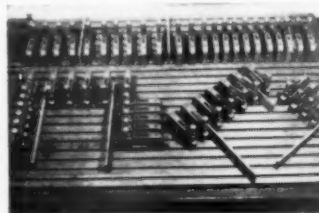
**FEATURES OF WALES UNITS.** Nothing is attached to press ram... self-contained punch and die holder... punch and die always in perfect alignment... each individual unit can be removed or reset on rails, templates or T-slotted plates instantly... punches, dies, guides, and strippers can be removed from units quickly... interchangeable punches and dies punch various sizes and shaped holes with the same holders... irregular patterns, not in straight line, can be punched with Wales Units... makes possible sliding one set-up out of the press and another pattern into position ready to operate... cuts die-setting time from hours to minutes... provides patterns unlimited.

**THE STRIPPIT CORPORATION, BUFFALO, NEW YORK**  
Specialists in Punching and Notching Equipment



← Line-up of Wales Units mounted on press rail.

→ Showing 3 set-ups of Wales Units on one T-slotted plate.



## —NEW LITERATURE—

ing tool setups, and other engineering data. A visual index is included for the convenience of the reader.

### (472) Metals

*Fatigue of Metals, Some Facts for the Designing Engineer.* 88 pp. The Nitralloy Corporation, 230 Park Avenue, New York City. Written chiefly for the designing engineer, this booklet is an introduction to the study of the conditions which limit the stress in metals by fatigue. It is illustrated with line drawings, graphs, charts, and photographs.

### (473) Motors

*Torq Motors Totally Enclosed, Fan Cooled.* 4 pp. The Torq Electric Manufacturing Company, Cleveland. This folder shows how these motors are constructed and also illustrates the various parts of the motor. Line drawings and complete specifications are given.

### (474) Turret Mill

*Rogers Vertical Turret Mill.* 8 pp. Rogers Machine Works, Inc., 125 Arthur Street, Buffalo, N. Y. This bulletin gives the complete story of these turret mills, their design, operation, and application features. It is completely illustrated and includes operation charts of the machine. Special features are listed and complete specifications are given.

### (475) Diamond Tools and Dressers

*Meyers "Dia-Brasive" Diamond Tools and Dressers.* 4 pp. W. F. Meyers Company, Inc., Bedford, Indiana. Emphasizing the use of diamond dressing tools, this folder describes and illustrates in actual size photographs the diamond tools made by this company. Also illustrated is the Meyers holder in different positions in use on magnetic chucks of surface grinders.

### (476) Print Making

*Simplified Print Making.* 24 pp. Ozalid Products Division, Johnson City, N. Y. The purpose of this booklet is to explain the Ozalid process of making dry developed, positive-type white-prints. The different models of the machine are described and illustrated and the outstanding features of each are listed. The booklet tells of three easy ways to make corrections without altering the original drawing. Complete specifications of each machine are given.

### (477) Care of Motors

*A Guide to Wartime Care of Electric Motors.* Allis-Chalmers, Milwaukee, Wisconsin. Taking a new slant at the subject of motor care under war conditions, this book is said to be of value to war plant engineers and is of advantage

## SHELDON Back Geared Screw Cutting PRECISION LATHES



### For the Tool Room

The finest 10", 11" and 12" lathes ever built in the moderate price field. Large special analysis steel spindles GROUND ALL OVER, with extra collet capacity. Hand-scraped Bronze. Ultra-Precision Ball or Super Precision Roller spindle bearings, (the finest bearings obtainable). Heavy braced, semi-steel beds with hand scraped ways (2 V-ways and 2 flat ways). These lathes come with a choice of aprons, gear boxes, and drives including the anti-friction, 4-speed, V-belt Lever-operated pedestal base motor drive illustrated. Telescopic Taper Attachment and other accessories available.



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Sheldon Lathes will stand up to any production work within their capacity—are ideal for second operation work. Production models available with any or all of these features: Ultra-Precision Ball or Super-Precision Roller spindle bearings. Lever-operated Collet Attachment. Lever-operated Tail Stock. Lever-operated cross slide with double tool post. Lever-operated turret, etc.

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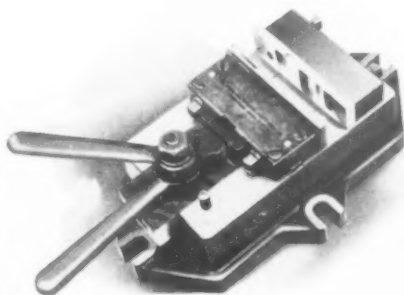
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### "Four Point" Milling Vise



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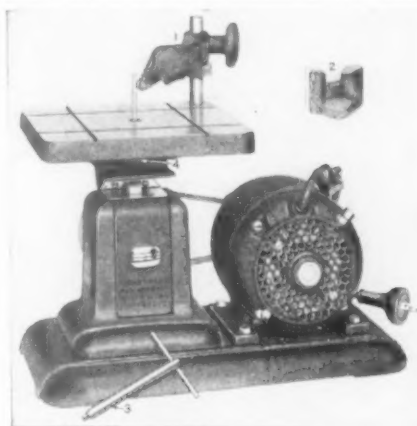
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1. Overarm to hold file rigid.
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**UNIVERSAL JOINT FILE CLAMP THAT ASSURES 100% VERTICAL FILE POSITION... Regardless of any Twist in File Shank For Quicker Setting Streamlined Performance**

Every tool and die man knows that one of the most troublesome and inaccurate tools that he must work with is the filing machine. This is due to crooked file shanks which bend off at a different angle from the file itself during the hardening process. As a result in a great many cases it is almost impossible to impart an absolutely true vertical motion to the file.

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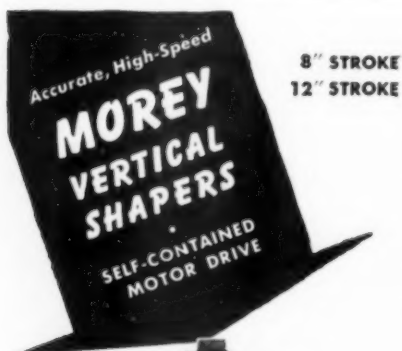


We are now in volume production manufacturing Precision Straight Side Serration, Involute Male and Female Splined Gages. We have a complete Spline Engineering Service for your convenience. May we have the pleasure of quoting on your requirements?

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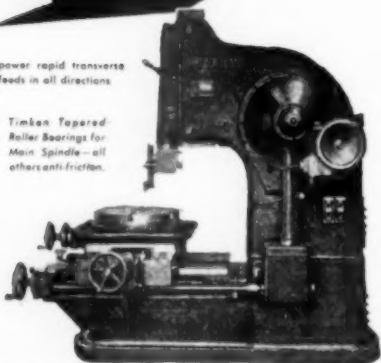
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power rapid transverse feeds in all directions

Timken Tapered Roller Bearings for Main Spindle—all others anti-friction.

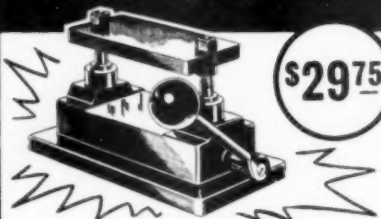


Built to highest accuracy standards the MOREY VERTICAL SHAPER is simple for tool-room manufacturing. Power feeds and power rapid transverse feeds in all directions are instantly available in all operating positions.

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## NEW LITERATURE

in the training of new men.

### (478) Thread Miller

*Waltham Thread Miller.* 4 pp. Waltham Machine Works, Waltham, Mass. Illustrations of this thread miller with extra equipment and special attachments are featured in this folder. The machine with standard equipment is illustrated and described and the general specifications are given.

### (479) Stamping Machine

*Cecostampings and the Chambersburg Cecostamp.* 34 pp. Chambersburg Engineering Company, Chambersburg, Penn. This catalog describes and illustrates a new type of production machinery originated specifically for the needs of the aviation industry. Samples of the stamping work done by this machine are shown and described. Many photographs show the machine at work at various aircraft plants throughout the country. Specifications are given and the die areas of the different size machines listed. An air consumption chart is included in the catalog.

### (480) Lapping Compound

*Ideal Bearing Surfaces at Minimum Cost.* 4 pp. Timesaver Products Company, 21 South DesPlaines Street, Chicago, Ill. This folder describes the action and gives the specifications of the compound. Application of this compound is mentioned in connection with gear lapping, bearing fitting, piston and cylinder lapping, flat and conical lapping, valve grinding and breaking in machinery.

### (481) Control Panels and Valves

*Hydraulic Control Panels, Hydraulic Control Valves.* Hydraulic Hi-Speed Company, 5438 Tireman Avenue, Detroit, Michigan. Many installation drawings of the control valves and panels are included in this catalog. Features and data are given on the different types of valves and panels.

### (482) Steel

*Vibro Chrome Tungsten Shock Steel.* 2 pp. Braeburn Alloy Steel Corporation, Braeburn, Pa. This literature is in data sheet form for a data notebook. It contains material on the chemical analysis, heating instructions, hardness, and applications for this type of steel.

### (483) Welding

*A New Welding Process to Speed Victory.* 4 pp. Eutectic Welding Alloys, Inc., 40 Worth Street, New York. This folder covers the salvaging of tools and machine parts through low temperature welding. It shows pictures of actual work being done by manufacturers in salvaging tools and machine parts. A

THE TOOL ENGINEER

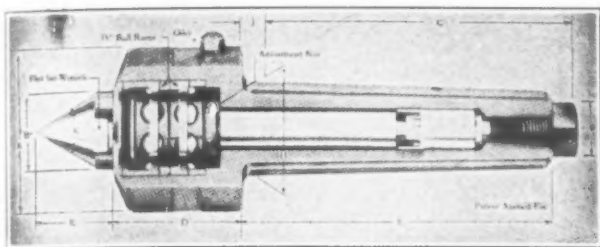
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LOAD CAPACITY—200 TO 40,000 LBS.  
AT 100 RPM.

HAVE ADJUSTMENT TO TAKE UP WEAR  
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## DON'T WAIT FOR TURRET LATHES

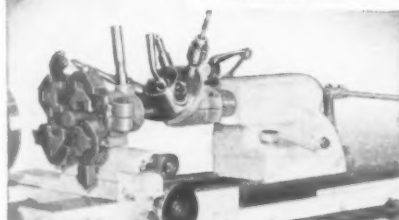
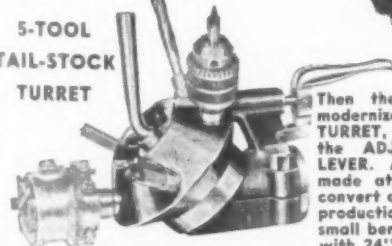


Photo Shows Turrets on 16" Lathe

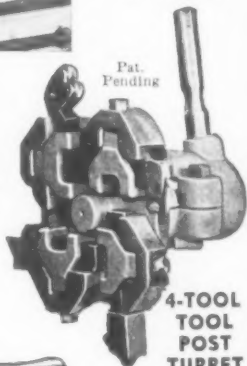
This new modern TOOL-POST TURRET, made in 2 sizes, designed to increase production on engine lathes. Easily mounted on cross slide or compound rest. Has capacity of 4 standard made tool holders which can be easily inserted and rigidly held.

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TAIL-STOCK  
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Convert Your  
ENGINE LATHE  
into a  
TURRET LATHE  
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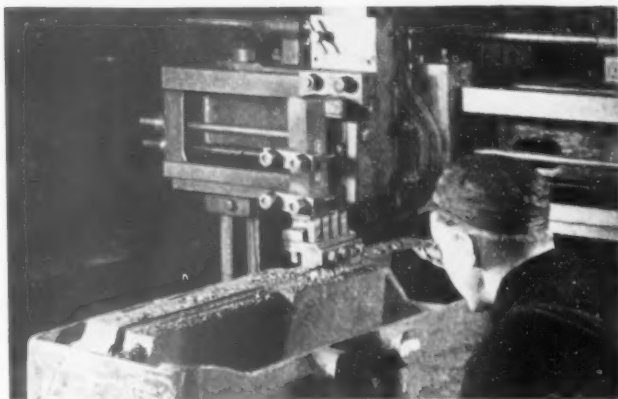
4-TOOL  
TOOL  
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TURRET

Then there's the completely modernized 5 Tool TAIL-STOCK TURRET, made in 4 sizes. Also the ADJUSTABLE PULL-FEED LEVER. All tools are precision made attachments which will convert any engine lathe into a production turret lathe. To fit small bench lathes up to lathes with 24" swing.

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ARMSTRONG TOOL HOLDERS are the most efficient tools obtainable, with correct cutting angles, maximum tool clearance, extreme rigidity and strength to stand up to any speed or feed. Use them for every operation on lathes, planers, slotters and shapers and for many operations on engine lathes, turret lathes and screw machines to "SAVE: All Forging, 70% Grinding and 90% High Speed Steel."



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# Rescue

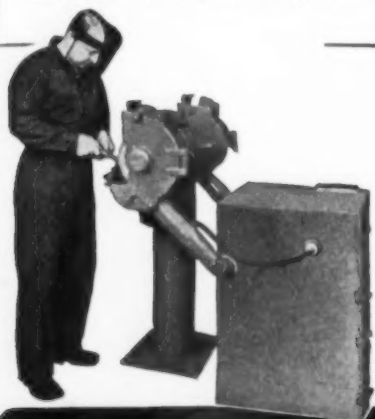
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SELF-CONTAINED UNITS

### —NEW LITERATURE—

table is included which lists the specifications for special alloys and fluxes.

#### (484) Gages

*Ellstrom Internal Setting Gage*. 6 pp. Dearborn Gage Company, Dearborn, Michigan. This folder describes and illustrates the uses of the gage. Construction details are given and the storage case for protection of the gage is illustrated.

#### (485) Nickel Alloys

*Publications on Nickel Alloys*. 16 pp. The International Nickel Company, Inc., 67 Wall Street, New York. This catalog lists many bulletins and folders available to production men, design engineers and metallurgists on the production and fabrication and the uses and properties of nickel alloys. The desired literature may be checked in the catalog and the catalog returned to the company which in turn will send the literature to the reader.

#### (486) Centers

*Increase Your Production With CMD Helical-Groove Centers and Center Point Lubrication*. 4 pp. Chicago Manufacturing & Distributing Company, 1943 West 46th Street, Chicago. This folder not only describes the center, but also shows it in action on various types of work. Features and specifications are given. The center point lubricants and their prices are listed.

### —HANDY ANDY SAYS—

(Continued from page 154)

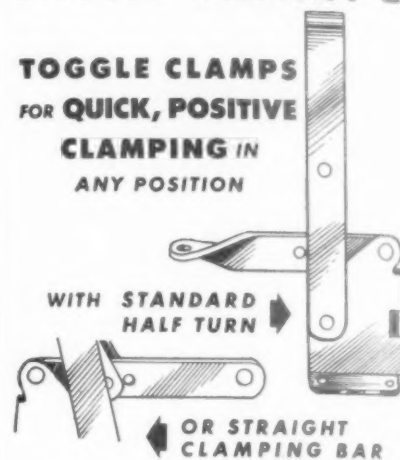
ent now since the Irish crowded the Swedes off Smith's Hill. There's something in a high birthrate, after all. But, among other things, I'm going to drop in on C. L. Tingley at Federal Products, having a yen to see his plant since it's grown up. And maybe I'll traipse up to Woonsocket, just to see if they still speak French instead of English in Social Village. Oh, I'm looking forward to a gay old time, including a bucketful of steamed clams and maybe a sniff or so of the Woonasquatucket River. Which reminds me that the steel shortage could be helped some if they'd dredge that crick for some of the "slumped" parts that's been *spoorlost verlohren* in its oozy depths these many generations. And that, gentle readers, will be all for now.

Handily Yours,

*A. B. Rylander*

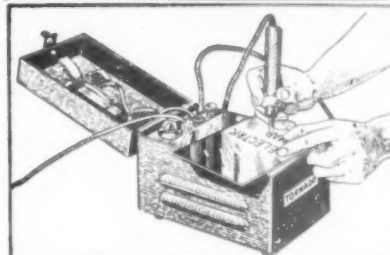
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**TOGGLE CLAMPS**  
FOR QUICK, POSITIVE  
CLAMPING IN  
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These two low-temperature-melting and expanding alloys are helping to speed up production of war materials for the Army, Navy and Air Force.

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## Torque Wrench

**MORE** ACCURACY  
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**NO** FRICTION  
ADJUSTMENTS  
MOVING PARTS  
FRAGILE MECHANISMS

Constructed for exacting laboratory work or continuous production use.

A practical wrench correctly engineered.

PERMANENT ACCURACY.

A capacity and size to fit your needs.

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ACCURATE MEASURING WRENCHES

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At Lower Cost!



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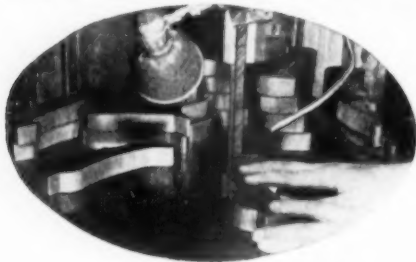
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Unmatched for  
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Scientifically designed from special steel, these better band files offer a sure, easy way to slash filing time records in plants everywhere.

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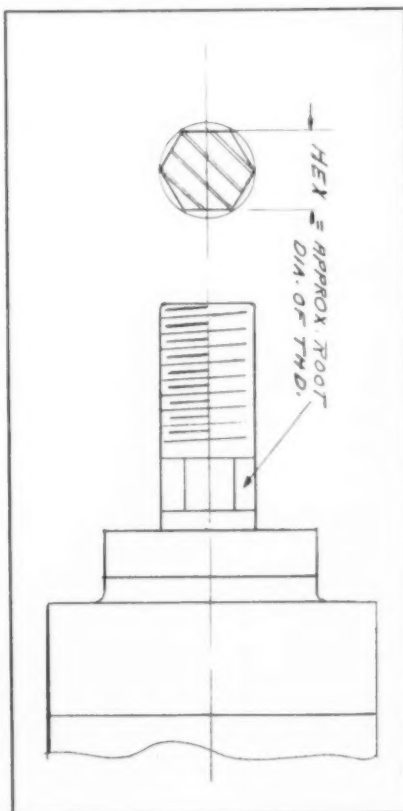
## THE DOALL CO.

1211 Thacker St. Des Plaines, Ill.  
Associated with Continental Machines, Inc.  
Minneapolis, Minn.



### "Grip" on Piston Rods Eliminates Scoring

Milling a hex on the piston rods of hydraulic or air cylinders permits a positive grip and eliminates scoring with pipe wrenches, which is not an uncommon occurrence on smooth rods. As shown in the illustration, the hex is milled just ahead of the packing gland cap, with rod in "shut" position. The diameter across flats is the



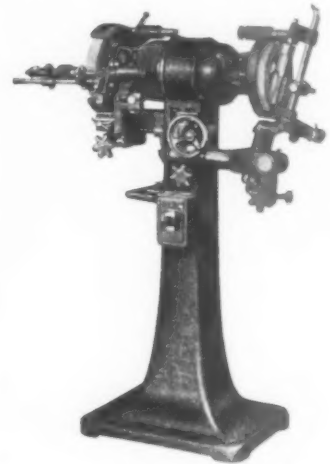
approximate root diameter of the thread, so that there is no weakening of the rod.

The contributor suggests that hex be wide enough for use with a standard S wrench and that thread be one and one half times or more the diameter of the rod.

(Continued on page 172)

## HIGH SPEED TAPS

NOW ON CRITICAL LIST.  
KEEP THOSE NOW IN SERVICE 100% EFFICIENT BY PROPER SHARPENING.



THIS NO. 12 GRAND RAPIDS  
TAP GRINDER MAKES THE  
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30 DIFFERENT STANDARD SIZE  
ADJUSTABLE DRILL HEADS,  
CAPACITIES UP TO 1½" DRILLS

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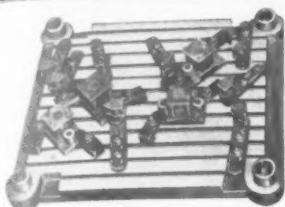
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Cincinnati, Ohio

# WHISTLER

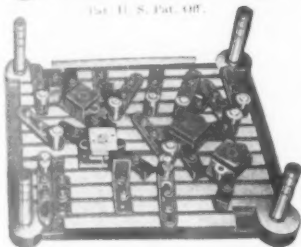
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**OPERATES LIKE ANY  
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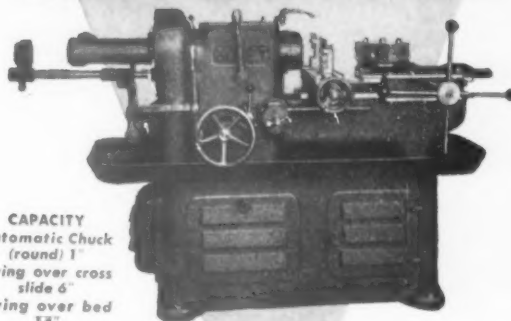
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### Back-Geared TURRET LATHE

Timken Bearing  
Self-Locking Turret and Infinite Spindle Speeds



**CAPACITY**  
Automatic Chuck  
(round) 1"  
Swing over cross  
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14"

Thousands of the MOREY 2G Turret Lathes are saving money with no sacrifice of high speed production. Economy features: Back Gears are instantly thrown in through extra large Twin Disc Clutch—Full advantage from high speed and carbide tools—Vibrationless precision and an infinite variety of spindle speeds for every job—Timken bearing—Self-locking turret. Can be furnished with tooling.

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## Rawhide HAMMERS

• As carefully made as the finest tool. Accurately balanced malleable iron heads on straight grained and polished hickory handles. Replaceable genuine Java Water Buffalo Rawhide faces which will not chip, shear, or split, providing a striking surface that is smooth and accurate to the last blow.

Cat. No.	Diameter in inches	Weight in pounds
0	1	$\frac{1}{2}$
1	$1\frac{1}{4}$	$1\frac{1}{2}$
2	$1\frac{1}{2}$	$1\frac{3}{4}$
3	$1\frac{3}{4}$	$2\frac{1}{4}$
4	2	4
5	$2\frac{1}{4}$	$5\frac{1}{2}$



These are the tough, resilient, long-lasting Rawhide faces made from specially treated Java Water Buffalo hide for use in Chicago Rawhide Hammers.

## Rawhide MALLETS

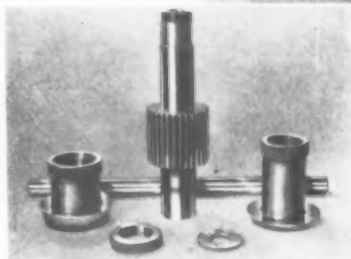
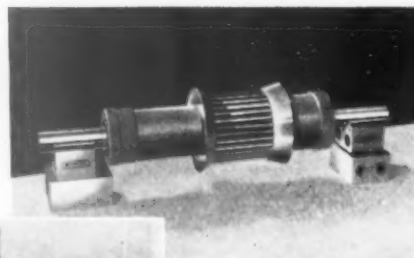
• Chicago Rawhide Mallets have solid, hard rolled Java Water Buffalo Rawhide heads securely glued and riveted, fastened to hickory handles with steel forged pin. A tool that is finely balanced for accurate blows, made for long service and safe to use.

Not Loaded			
Cat. No.	Diameter Inches	Length Inches	Weight Qzs
0	1	$2\frac{1}{8}$	2
1	$1\frac{1}{4}$	3	$3\frac{1}{2}$
2	$1\frac{1}{2}$	$3\frac{1}{4}$	6
3	$1\frac{3}{4}$	$3\frac{1}{2}$	$7\frac{1}{2}$
4	2	$3\frac{1}{2}$	10
5	$2\frac{1}{4}$	$4\frac{1}{4}$	21
6	$2\frac{3}{4}$	$4\frac{1}{4}$	23
Loaded Mallets			
7	$1\frac{1}{4}$	3	8
8	$1\frac{1}{2}$	$3\frac{1}{8}$	12
9	$1\frac{3}{4}$	$3\frac{1}{8}$	16
10	2	$3\frac{1}{2}$	20
11	$2\frac{1}{4}$	$4\frac{1}{4}$	42

CHICAGO *Rawhide* MFG. CO.  
193 ELSTON AVE. ★ CHICAGO, ILLINOIS.

## VINCO

### ACCURACY



To Within  
**SPLIT  
TENTHS**

Illustrated is a Vinco spline relation flush pin gage and balancing arbor for an S. A. E. 60 propeller hub. It is shown both in assembly and as individual parts.

This job called for extreme accuracy. Tolerances of every part were held to split tenths. It is typical of the work being turned out regularly by Vinco Corporation.

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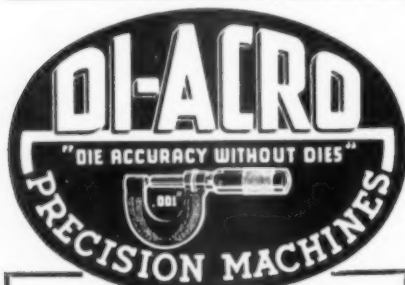
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WOOD



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here is fast die-less  
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rate to .001". Time  
has an A-1-A priori-  
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If you have Di-Acro  
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dozens of other  
uses for them.

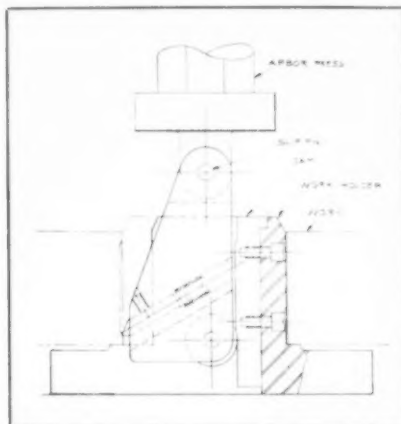
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307—8th Ave. S. Minneapolis, Minn.

*The DI-ACRO SYSTEM of*  
**METAL DUPLICATING**  
*—without Dies!*

### Broaching Oil Grooves Made Easier

Blind longitudinal oil grooves may be quickly broached with the tool shown in schematic layout. The principle can be variously applied, with design to suit the job.

An adjustable tool bit, ground to the desired form and held in a cage,

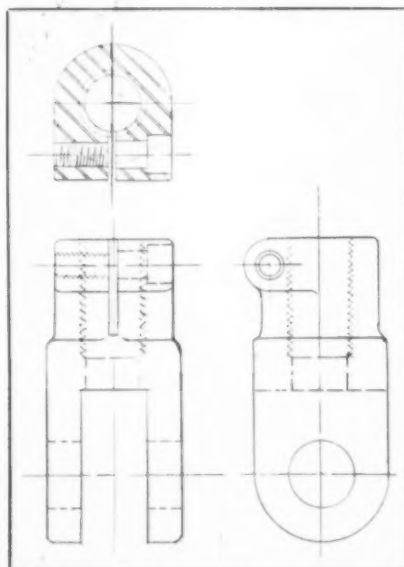


is backed by a roller ride-up against a cam in the work locator. The tool may be dropped clear of the work, to save drop wear in return stroke, by removing the hinge pin. A simple index may be provided if more than one groove is to be broached.

### Eliminating Loose Clevises Without Jam Nuts

The clevis shown, to be used in combination with air or hydraulic cylinders, has the feature that no jam nuts are required to lock it to the piston rod. One merely adjusts it to the required section, and when light-

(Continued on page 174)



## GARRISON GEAR CHUCKS

are used on—

- GEAR SHAPERS
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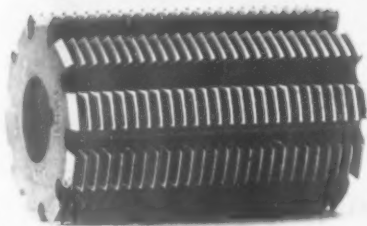
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MACHINE WORKS, INC.  
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## MULTIPLE THREAD MILLING HOBS



—in any thread system, any thread angle, any thread form. Inch or metric scale. Left or right hand threads. Free from distortion. Up to 7" O.D., and 4" thread length for internal or external threading.

**TOLERANCES: FOR THREAD DEPTHS AND PITCHES  
LESS THAN 1/10,000 INCH**

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**For faster,  
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**BRS** Brown & Sharpe Mfg. Co.  
Providence, R. I., U. S. A.

# BROWN & SHARPE TOOLS

**The SKILL needed in tapping  
is BUILT RIGHT INTO THIS**

**Ettco-Emrick**  
FOOT-OPERATED  
**TAPPING  
MACHINE**

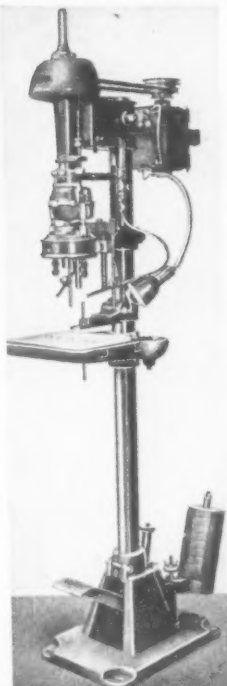
That's why *unskilled labor* can give you such high tapping production on this machine—**2400 accurately tapped holes per hour** with the standard 2-spindle head as shown—and up to **12,000 per hour** with available Ettco-Emrick Multiple Tapping Heads. All the operator has to do is place the work and step on the foot pedal. The design eliminates the human factor from the actual tapping operation.

**FOR FULL DETAILS WRITE  
FOR THESE 2 BULLETINS**

BULLETIN No. 4 covers the Machine and  
BULLETIN No. 3 the Multiple Heads.  
COPIES MAILED TO YOU ON REQUEST

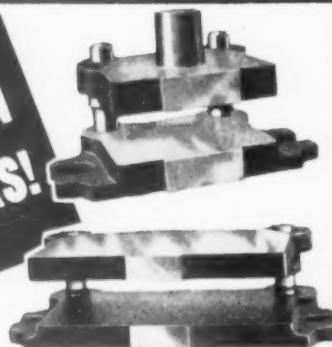
**ETTCO TOOL CO., Inc.**

586 Johnson Ave., Brooklyn, N. Y.  
Detroit Chicago



MAKERS  
OF **Ettco-Emrick** DRILL CHUCKS • TAP CHUCKS  
MULTIPLE TAPPING AND DRILLING HEADS  
TAPPING ATTACHMENTS • TAPPING MACHINES

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Whether your need is in the East or the West, we can give you complete, quick service on Producto equipment.

Producto Die Sets are made in a wide variety of designs to meet the exacting demands of present day high production. There is one to fit exactly the die construction best suited to your stamping needs.

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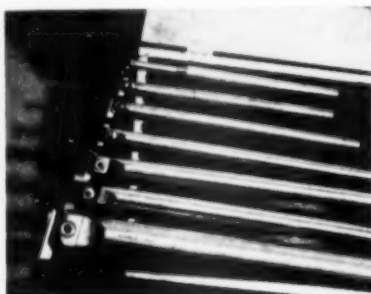
3017 Medbury Ave., Detroit, Mich.

Also Die Supply Co., 1390 E. 30th St., Cleveland, Ohio.  
Pacific Coast users, contact Joseph C. Fletcher, San Francisco.  
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Number 3 Set

These are the only boring bars on the market having the economical triangular bit, permitting the use of a larger bar diameter as the bit cuts ahead of the bar. This new design insures rigidity, making higher boring speeds and heavier cuts possible.

Everede Boring Bars are made of the finest heat treated nickel steel and each bar is furnished with six triangular high speed steel bits.

The Everede Boring Bar also permits the use of a solid stellite or carbide tool bit by clamping the bit in the "V" Type grip holding it firmly without danger of breakage.

Write for descriptive folder.

### EVEREDE TOOL CO.

WILLIS STUTSON  
184 N. Wacker Drive Chicago  
Representatives in principal cities

ening the clamp screw locks it firmly to the rod.

Once clamped, it will stay put, will not shake loose with danger of stripping threads or breaking rods because of shock resulting from loose clevises.

### Handy Andy Piston Rods Supplied by Manufacturers

In this month's "crib", Handy Andy Rylander, Tool Engineer Technical Editor and Midland Steel engineer, proposes the use of a hexagon wrench grip on the piston rods of air and hydraulic cylinders. The innovation was designed because during installation and servicing, ordinary smooth rods are usually gripped with pipe wrenches which score the rod and eventually damage the packing. This results in recurrent leakage around the glands and entails considerable expense as well as time lost in production. By using the hex grip, however, this leakage can be eliminated.

Mr. Rylander originally passed the idea along in this department some months ago. Now, the majority of manufacturers of hydraulic cylinders will supply piston rods with hex grips, when specified.

Particularly interesting is the fact that the American Equipment Company (Detroit & Toledo representatives of Logansport Machine Inc.) has specifically designated this design as the "Handy Andy Piston Rod".

### Let's Stock the Crib; You'll Find it Profitable

Just as the cribs in your plant must be re-stocked each month, so must the TOOL ENGINEER Magazine "Crib" be re-stocked monthly.

Tool Engineers now generally recognize the dissemination of time and cost saving ideas they may have developed as all-important contributions to the war effort.

Want to give some hardworking Tool Engineer a helping hand? Send in one or more such items as appeared in this month's column. Don't worry about the grammar in writing. The idea is what counts. Send a rough or finished sketch or photo. If the item is placed in the "Crib", you get a check for \$5.00.

Easy money? Engineers who sent the items used since the "Crib" was started in the June issue think so.

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Cool running and longer life. Available in various sizes, shapes and types. To insure prompt delivery WRITE for data on specific equipment needed.

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We owe a lot to the NEW  
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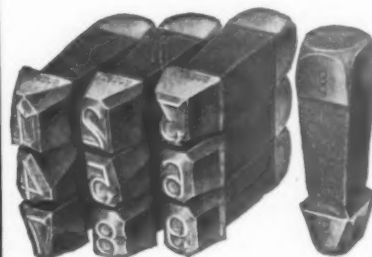
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OF  
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## PRODUCTION TOOLS

ORIGINATORS AND  
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FLUTED TAPER PIN REAMERS

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# DOUGLAS

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WIDE RANGE OF  
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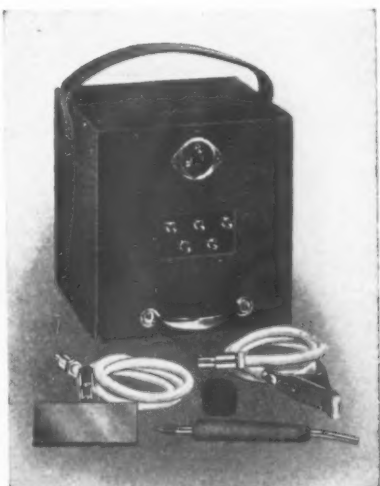
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BY LARGE SCALE PRODUCTION

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Mark Iron,  
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*Etchograph*  
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fixtures of any ferrous metals including the  
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plainly.

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**MAJESTIC**  
**INTERNAL**  
**GRINDER**

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Length of table, 48". Swing over table, 10". Travel of cross slide,  
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head. Speeds—100, 225, 350 r.p.m.

Write for complete details contained in New Bulletin

**Majestic Tool & Mfg. Co.**  
2950 E. Woodbridge Detroit, Mich.

# THE PASSING PARADE . . . .

The Ever-Changing Scene in Mass Manufacturing



**W. M. A. WESTON** has accepted the position of general manager of the Universal Lubricating Systems, Inc., at Oakmont, Pa. Previously **MR. WESTON** was tool supervisor of ordnance of the Oil Well Supply Company of Oil City, Pa.

**J. STANLEY DOWNS**, after 19 years of service as superintendent of the Hercules Cement Corporation Works plant,

at Stockertown, Pa., has retired. His position is being taken over by **MR. WARREN L. BREINIG**, who for many years has been assistant superintendent in charge of the plant.

**S. H. MORTENSEN**, engineer-in-charge of A-C design for 10 years, has been appointed chief electrical engineer of the Allis-Chalmers Mfg. Co. plants at West Allis, Cincinnati, Boston and

Pittsburgh. **MR. MORTENSEN** started at the Allis-Chalmers Norwood works in 1905.

**JOSEPH A. ELWOOD** has just been appointed as general works manager of the George Gorton Machine Company, Racine, Wisconsin. **MR. ELWOOD** is one of the founders of the Racine Chapter of the American Society of Tool Engineers and has been a former national committee member and director of the national body. For 19 years he was associated with the Nash Motors, one of



It may be costing you production and profits to think "all Carbide Tools are alike". They're NOT!

There are as many differences among carbides as there are among steels. These differences affect hardness, density, uniformity and cutting qualities. Your eye can't detect the quality of a carbide tool—but you can very quickly see it in your production records.

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Branch Office: 2906 Euclid Avenue, Cleveland, Ohio

Pioneers in Tungsten Carbides for Over a Quarter Century



**JOSEPH A. ELWOOD**  
George Gorton works manager.

his jobs being division superintendent in charge of tool production of the Racine division. Later he was connected with the Ajax plant of the Walker Manufacturing Company in charge of production. Until recently, he was factory manager of the hydraulic division of the Sundstrand Machine Tool Company at Rockford, Ill.

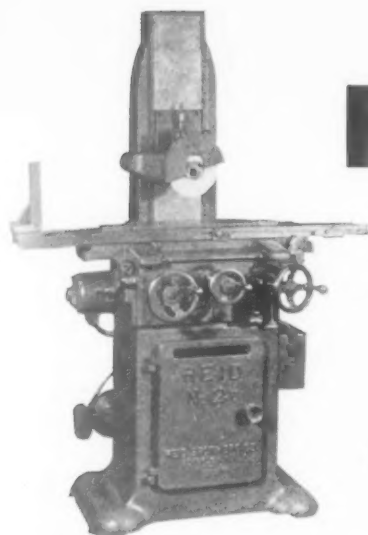
**WILLIAM B. GRIESE**, plant manager of the Lycoming Division of The Aviation Corporation, has been made plant manager of the company's new Liquid Cooled Engine Division, it has



**WILLIAM B. GRIESE**  
Plant manager of new division.

just been announced. He will be succeeded at Lycoming by **M. I. BRAD-**

**THE TOOL ENGINEER**



# THE REID

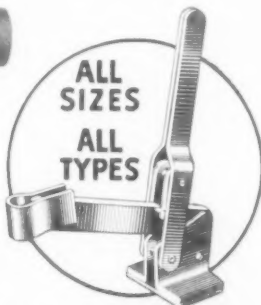
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387 Charles St., Providence, R. I.  
*A Reid Distributor in Every Principal City*

**B**ELOW is tubular part locked in simple checking fixture. Two De-Sta-Co Toggle Clamps assure quick, positive clamping . . . yet provide instant, easy release.



## DE-STA-CO Toggle CLAMPS

are used in the designing of fixtures for welding, drilling, machining, reaming, inspection, assembly or other production operations. Large line, all sizes, each clamp carefully engineered to assure smoothness of operation and give maximum life. Designed, manufactured and sold by a reliable concern, having over 25 years of manufacturing experience.

*Bulletin No. 41 illustrates many practical uses and is a catalog of the many models and sizes . . . send for your copy today.*

**DETROIT STAMPING CO.**  
*Established Over 25 Years*  
356 Midland Ave. • Detroit, Mich.

AUGUST, 1942

## Send for Valuable Booklet

Forgings For All Industries  
Rough Turned or Finished Complete



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Composite Die Sections  
Extrusion Tools  
Crankshaft Forgings  
Gear Forgings  
Die Casting Dies

•  
Rings, Discs, Blocks,  
Shafts, Hubs, Bars,  
and Special Shapes.  
Tool Steel of all  
Makes

S.A.E. Specifications

### STAINLESS & COPPER FORGINGS

*May We Serve You?*

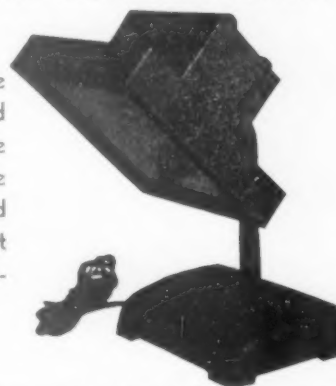
## AJAX STEEL & FORGE Co.

205 ADAIR STREET

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## ACME MONOCHROMATIC LIGHT with ACME GLASS OPTICAL FLATS SIMPLIFIES MICRO-INCH MEASUREMENT

★ Where light-wave measurement is used to determine surface flatness, and where optical flats are used as comparators, light of a single wavelength is required.



### INCREASES THE VALUE OF YOUR OPTICAL FLATS

The large bright working field of the Acme Monochromatic Light avoids the necessity of exact placement of the work, and makes inspection easy and fast. Interference bands can be seen on a relatively dull surface or through an appreciable air gap. This decreases scratching and wear of your glass flats as it is unnecessary to rub them together to squeeze out the air film.

*For better, faster light-wave measurement, order the Acme Monochromatic Light today!*



## ACME INDUSTRIAL CO.

Makers of Standardized Jig and Fixture Bushings  
208 N. LAFLIN ST. CHICAGO, ILL.  
Telephone: MONroe 4122



LEY, works manager. First associated with The Aviation Corporation in February, 1941, MR. GRIESE was for 17 years with the Crosley Corporation in Cincinnati, in recent years as plant superintendent. He is a member of the National Aeronautics Association, the Society of Automotive Engineers and the American Society of Tool Engineers.

L. W. REULAND, who has been in charge of small Tool Engineering at Barber-Colman, Rockford, Illinois, has been advanced to the position of superintendent of the small tool division. MR. REULAND takes over the position left

vacant by MR. G. H. DEYO, who has resigned to become president of the D & D Tool Company in Detroit. MR. REULAND is at present co-chairman of the Rockford Chapter of the American Society of Tool Engineers.

J. D. O'BRIEN, production manager of the Inland Manufacturing Division, Dayton, Ohio, has been promoted to general manager of that division, according to personnel changes announced by General Motors.

WILLIAM P. GWINN has just been appointed as assistant general manager



**L. W. REULAND**  
Advances at Barber-Colman.

of Pratt & Whitney aircraft division of the United Aircraft Corporation at East Hartford. MR. GWINN has been assistant sales manager of Pratt & Whitney and has been with the concern for 15 years.

COL. W. S. BROBERG, deputy district chief of the Springfield Ordnance District has received orders from the War Department transferring him to the office of the Chief of Ordnance, Washington, D. C.

BRIG. GEN. EARL MCFARLAND will be the commanding officer of the U. S. Armory in Springfield, Mass., according to confirmation of the appointment received by COL. JOHN A. BROOKS, JR., acting commander.



**GUSTAVE KOCH**  
Heads training at Bell Aircraft.

GUSTAVE KOCH has been appointed director of training at the Bell Aircraft Corporation, Buffalo, N. Y. In his new capacity, MR. KOCH, for the past four years head of the science department of the Tonawanda High School, will assume supervision of production training operations at the company's plant on the Niagara frontier.

GEORGE H. BORK, former vice president of Harvey-Whipple, Inc., Springfield, Mass., has been appointed senior industrial training specialist by the Federal Security Agency in Washington.

LAWRENCE Y. SPEAR, formerly

**THE TOOL ENGINEER**



## ALL PRECISION and a yard wide

IF YOU are a manufacturer of aircraft engines, Cushman Chucks are helping you to keep 'em coming and "keep 'em flying". Cushman Precision and Cushman ability to "take it" from three shifts of hard-driving operators are helping you to keep ahead of stepped-up production schedules.

This may be the first time you have really used the great reserve of strength and sustained accuracy

built into every Cushman Chuck. And we consider it part of our contribution to the winning of this war to help you get both maximum production and maximum service life from your chucking equipment.

We will be glad to send you a supply of "Chuck Check" maintenance cards for distribution in your plant. You may find them particularly useful in training new operators.

**CUSHMAN**  
THE CUSHMAN CHUCK CO. HARTFORD, CONN.  
CHUCKING ENGINEERS • SINCE 1862

# Columbia TOOL STEEL

## IMPORTANT—

The efficiency of the program for war production is dependent on the **tools** that do the work.

"It pays to use Good Tool Steel" to make these important tools.

*It pays to use  
Good Tool Steel.*

**COLUMBIA TOOL STEEL COMPANY**

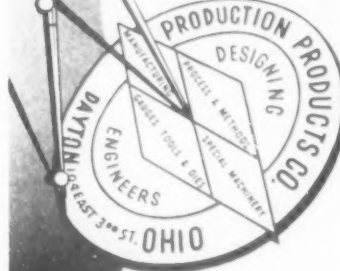
ARTHUR T. CLARAGE, PRESIDENT

GENERAL OFFICE AND WORKS

500 EAST 14TH STREET • CHICAGO HEIGHTS, ILL.

# Proven Performance

## FOR VICTORY!



• Whatever your production problem may be . . . call on THIS organization! Our experience working with the leading tool engineers in planning to solve production problems is of value to you in processing and designing all types of special equipment for emergency needs.

We have processed and designed tools on programs for Aeroplane parts, ordnance parts, carburetors, motors, radio sending sets and numerous other precision parts.

(Chicago Division, 2400 West Madison St.)

**PRODUCTION PRODUCTS CO.**

*Engineers of Complete Tooling Programs*

104 EAST THIRD STREET • DAYTON, OHIO



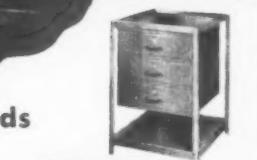
## Makes America's Hands More Productive

These time-proved units help you speed up War Products output by assuring faster handling of assembly and sub-assembly work, conserving space, guarding against accidents and guarding against fire and sabotage losses. Write for catalog.

**LYON METAL PRODUCTS, INCORPORATED**

General Offices:

7908 Madison Avenue, Aurora, Illinois  
Branches and Distributors in  
All Principal Cities



Tool Stand with  
3-Shift Insert



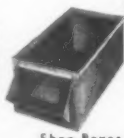
Foreman's Stand  
with 2-Shift Insert



Stools



Machine  
Tool Bench



Shop Boxes



Work Bench  
with 3-Shift Insert

Bench Legs

**LYON METAL PRODUCTS, INCORPORATED**



## BENCH MODEL PROFILE GRINDER

Boyar-Schultz Profile Grinder No. 1 saves many times its cost in grinding and fitting dies and punches, grinding cams, templates and die clearances.

Its high spindle speed—approximately 20,000 R.P.M.—removes stock rapidly, even with small diameter wheels that can be used in confined openings and small radii.

Circular Tells All About It—Write For It

**BOYAR - SCHULTZ CORPORATION**

2116-H WALNUT ST.

CHICAGO, ILL.

vice president of Electric Boat Company, Hartford, Conn., has been elected president of the company to succeed the late **HENRY R. CARSE**.

**BRUNO LOEFFLER**, formerly chief engineer of Mack trucks, will be chief engineer of the American Bosch Corporation in charge of all engineering and design, it has just been announced.

**HOWELL W. MILLER**, formerly with the Westfield Aircraft Company at Barnes Airport, Westfield, Mass., is now with the Pratt & Whitney Aircraft at East Hartford, Conn.

**CAPT. NORMAN B. ELLISON** has reported for duty at the United States Armory, Springfield, Mass. **CAPT. ELLISON**, formerly sales manager of the Moore Drop Forge Company, Springfield, will serve as assistant to the officer in charge of the arsenal.

**JAMES Y. SCOTT**, president of the Van Norman Machine Tool Company, Springfield, Mass., has agreed to serve as vice chairman of the Springfield War and Community Fund, Inc.

**H. F. HILDRETH**, manager of the commercial refrigeration and air condi-

tioning division of the Westinghouse Electric and Manufacturing Company in East Springfield, Mass., has been appointed to the industrial refrigeration advisory committee of the War Production Board.

**EDWARD F. MORAN**, who established the field office of the X-ray division of the Westinghouse Electric and Manufacturing Company in Springfield, Mass. in 1938, has been promoted to the post of assistant to the manager of the division.

**RACY D. BENNETT** has joined the engineering staff of the Vinco Corporation, Detroit. **MR. BENNETT**, who will take over the position of development engineer, has operated an engineering and consultant service for the past two years. Previous to that he was with the Ex-Cell-O Corporation, Buick Motor Division, Kraetke Brothers, and Snyder Tool and Engineering Company.



**RACY D. BENNETT**  
Joins Vinco engineering staff.

**L. A. WARD** is also a recent addition to the Vinco engineering staff. He was associated with **MR. BENNETT** up to the time that both joined the Vinco organization.

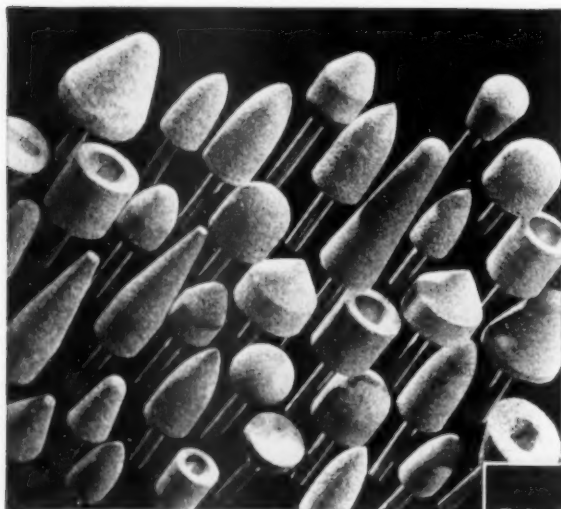


**L. A. WARD**  
Goes to Vinco with Bennett.

**EDWARD F. MORGAN** and **JAMES A. CARTER**, formerly with Henry Prentiss & Company, are now connected with the George Keller Machinery Company, Buffalo, N. Y. **MR. MORGAN** will be associated with the Buffalo office and

THE TOOL ENGINEER

## FINISHING THE **JOB** BEHIND THE LINES



**CHICAGO MOUNTED WHEELS**

Made of V/T Super Bond, they have real stamina, give unmatched performance and last 150% to 300% longer than ordinary wheels.

Chicago Wheels were the first small wheels mounted on steel shanks. Today there are over 200 different shapes to serve you—made in a variety of abrasives, grains, grades, mounted on shanks of various lengths and diameters of 1/4", 3/32", 1/8" and 3/16".

### TRY ONE ABSOLUTELY FREE

Tell us the kind of job, size and wheel speed you use, and we'll send you a test wheel postpaid.

**BRAND NEW CATALOG**—Just off the press, this book is prepared in the modern manner—loads of illustrations, concise descriptions of the complete line of Chicago Mounted Wheels. Send for copy.

### CHICAGO WHEEL & MFG. CO.

Makers of Quality Products for over 40 Years

1101 W. Monroe St., Dept. TE, Chicago, Ill.

Keeping up with Uncle Sam's victory drive for more tanks and guns and planes, Chicago Mounted Wheels are doing a big finishing job in shops everywhere—taking care of every kind of delicate or tough grinding job faster, smoother and better.



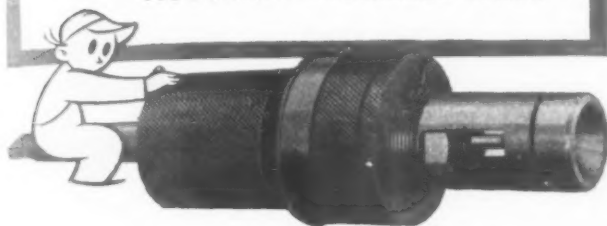
**HI-POWER GRINDER**

A real production grinder that is saving many man hours. Weighs 3 pounds, yet is so well balanced that fatigue is practically eliminated. Has enough power to drive a 2 1/2" diam. wheel. Speed 17,000 r.p.m. In case with 3 Chicago Mounted Wheels, Drum Sander and Bands, extra Collets, Wrenches, Dressing Stone, \$38.50.

☐ Send Hi-Power ☐ Catalog TE-8  
☐ Free Wheel. Size .....  
Name .....  
Address .....



## UNIVERSAL CENTERING CHUCKS AND STANDARD CHUCKS STEP UP ACCURACY—INCREASE SPEED



Above: Universal Centering Chucks convert a drill press into a centering machine. Furnished with a set of bushings and collets for various size center drilling. Accurate and sturdy. Depth adjustment for centers. Write for facts.



Above: Universal Standard Collet Chucks hold tools in a grip as strong as solid steel itself. Nut for spanner wrench. The ideal tool for holding end mills, keyway cutters, drills, etc. Write for facts.

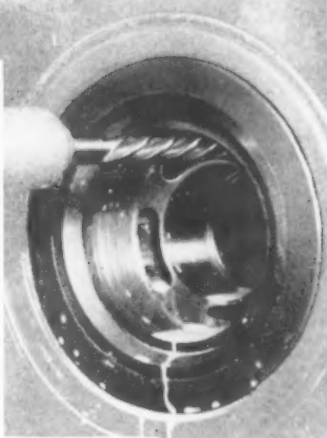
**UNIVERSAL ENGINEERING CO.**  
FRANKENMUTH • MICHIGAN

## UNUSUAL DEPTH...SPECIAL CONTOURS ...A Job For Putnam End Mills

Few operations provide a greater test for end mills than the milling of these four slots in a breech housing. On this job, standard extra long Putnam Hi-Speed End Mills are used.

The tools finish mill a deep slot with a radial contour. In addition, considerable tool length is required to reach the slots which are deeply recessed from the front face of the part. Running at fast speeds in high chrome steel, an exceptional strain is put upon the end mills during the cutting operations.

It is significant that very little breakage—and, as a result, a minimum of production slow-down—has occurred with Putnam End Mills in constant use.



**PUTNAM TOOL COMPANY**  
2987 Charlevoix Ave. • Detroit, Michigan

## PIECE PART CONTROL HELPS YOU CONTROL COSTS!

Air Vise Fixture with Piece Part Control—an exclusive Haskins development—sharply lowers tapping cost on this time fuse body. War or peace, Haskins Tappers help you get more production per man and machine hour. Being **standard** machines, they can be quickly and inexpensively converted to private industry production when normal conditions return. R. G. Haskins Company, 2756 W. Flournoy St., Chicago.

**NEW BOOKLET**—"Holding Fixtures for Haskins Tapping Machines". Send for a copy.



**HASKINS**

Precision  
TAPPING  
EQUIPMENT



## FOR INTERCHANGEABLE MARKING USE ... *The "Champion"* STEEL TYPE HOLDER

The "Champion" steel type holder (Patented) permits rapid interchangeable marking of flat, curved, concave or convex surfaces ... assuring alignment and perfect spacing of characters. Pressure of thumb on spring actuated button releases type for instant changing. Holder shown is hand style. Also made with shank, for press production marking.



Construction

Quick Changing



"Champion" Holders and "Tuf-Face" type are furnished in partitioned wooden boxes as illustrated, for easy handling and for keeping type in place. Cross-sectional view shows simple, fool proof type changing mechanism. Write for information and prices.

**JAS. H. MATTHEWS & CO.**

3945 FORBES ST. • PITTSBURGH, PA.

New York—Chicago—Phila.—Boston—Detroit—Newark—Syracuse

DISTRICT SALES OFFICES • CLEVELAND • HARTFORD • BIRMINGHAM

## T. H. L. FRONT LEVER BENCH PUNCH



Built for hard tough work — die cannot lose alignment with punch — all parts interchangeable.

Capacity  $\frac{1}{2}$ " holes through  $\frac{1}{8}$ " steel;  $\frac{3}{8}$ " through  $\frac{1}{4}$ " steel. Can also be made for holes up to  $\frac{3}{8}$ " in thinner metal. Stock punches and dies available from  $\frac{1}{8}$ " to  $\frac{1}{2}$ " by 64ths.

Weight, 70 lbs.

PRICE WITH ONE PUNCH AND ONE DIE—

**\$50.00**

Immediate Shipment

**T. H. LEWTHWAITE  
MACHINE CO.**

(Est. 1890)

307 E. 47 St.

NEW YORK

- **MACHINE DEVELOPMENT**
- **MACHINE DESIGN & BUILD**
- **TOOL DESIGN**

Quotations promptly furnished — **WIRE** or **WRITE** Today.

**PROVEN  
DEPENDABLE  
SERVICE**

**McGOWAN**  
**ENGINEERING SERVICE**  
★ 486 PAWTUCKET AVE. ★  
PAWTUCKET - RHODE ISLAND

## PASSING PARADE

MR. CARTER will be the Rochester representative of this company.

IRA J. SNADER, division manager of the Republic Aircraft Products Division of the Aviation Corporation, has been made vice-president of manufacturing of that corporation. He will be succeeded at Republic by **STERLING B. WITHERINGTON**, formerly general manager of the Brunswick-Balke-Collender Company, Muskegon, Michigan. MR. SNADER became associated with the Aviation Corporation in December, 1940. For eight years before that he was in charge of standard machine tool design and production at the Ex-Cell-O Corporation, Detroit. He was one of the founders and the first treasurer of Ex-Cell-O. He was also assistant chief engineer in charge of tooling at the Wilson Foundry & Machine Company at Pontiac, Michigan, and production engineer at Wright Aeronautical Corporation, Paterson, New Jersey.



**IRA J. SNADER**

Now a vice-president of manufacturing.

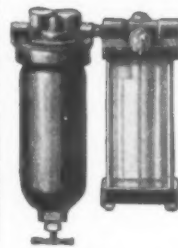
LYNN A. WILLIAMS, JR., secretary of Stewart-Warner Corporation and head of the company's legal department was elected a vice-president of the Corporation.

JAMES A. HERRINGTON has been elected president of Knu-Vise, Inc., Detroit, to occupy the position recently vacated by **FRANK MCKENNA** believed to be lost somewhere in the West. HERRINGTON joined the Knu-Vise organization as general manager in 1939, coming from the Fruehauf Trailer Company where he was assistant superintendent of the body plant.

JULIUS REIDEL, formerly chairman of the Milwaukee Chapter of the American Society of Tool Engineers, has been made Master Mechanic at the Nash-Kelvinator New Orleans airplane assembly plant.

WALTER F. CAHILL was recently appointed agent for the Lincoln Park Tool and Gage Company of Lincoln Park, Michigan, for the State of Michigan, exclusive of Wayne County and Toledo, Ohio. For the past nine years he has been associated with the Na-

## M - B AIR-LINE FILTER and AUTOMATIC LUBRICATOR



**Eliminates  
Costly  
Shut-Downs**

due to foreign matter in air-lines and lack of lubrication at working points.

**Removes 96% to 97% of  
All Water, Dirt and Scale**

from air-line. Air passes through a series of brass discs with .002 spacings, which are  $2\frac{1}{2}$  times finer than 120 mesh screen, affording the finest degree of filtration that can be obtained by any known method.

Then, as the air passes through the head of the Lubricator, oil is delivered into the purified air-line in any desired volume.

**Write for Literature  
and Free Trial Offer**

**M-B PRODUCTS**

EXPORT OFFICE

120 E. LARNED ST., DETROIT, MICH.

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NEW YORK, N.Y., U.S.A.



**MOORE'S DIAMOND POINT  
ELECTRIC GRAVER**

**WILL DO THAT MARKING JOB  
ENGRAVES WOOD, PLASTICS,  
GLASS, ALL METALS, INCLUSIVE**

**HARDEST STEEL**

WORKS FROM 110-120v 50-60 CYCLE, A.C.  
THROUGH A SPECIAL TRANSFORMER  
COMPLETE OUTFIT .....\$22.50

ORDER NOW ON 10 DAY TRIAL  
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QUICK DELIVERY ON RATED ORDERS

**WILLIAM MOORE MFG. CO.**  
653 SOUTH STATE ST.  
CHICAGO, ILL.

## Reclinable POWER PRESSES



This press has long been considered the most suitable and favored type for general stamping work. Its features have been standard for a number of years, but many important improvements in details make the latest model outstanding. Its high performance is the result of thorough research, sound engineering and careful designing.

The Type 36 Press is available either plain or back geared, and the models range from 4 to 100 tons capacity.

Complete information on this and other Z & H presses will be sent on request.

**ZEH & HAHNEMANN CO.**  
192 VANDERPOOL STREET, NEWARK, N. J.

## TAKE DEEPER CUTS AT HIGHER SPEEDS WITH **IDEAL** LIVE CENTERS

IDEAL Live Centers not only permit deeper cuts at higher speed, but can carry heavier loads, because the IDEAL Live Center rotates with the work. Radial load carried by high precision ball bearings, thrust load absorbed by high precision taper roller bearing. All parts hardened and ground.

### TRIPLE DUTY

Three Interchangeable Center Pieces (illustrated below) for all kinds of centered and uncentered work. Save set-up time.



### OTHER PRODUCTION SPEEDERS



Write for Free  
Descriptive Literature

**IDEAL COMMUTATOR DRESSER COMPANY**  
4152 Park Avenue Sycamore, Illinois  
SALES OFFICES IN ALL PRINCIPAL CITIES  
In Canada: Irving Smith, Ltd., Montreal, Quebec

AUGUST, 1942

## Air Valve SERVICE

For over 16 years Ross has concentrated its efforts in the production of one product . . . air control valves . . . for use in controlling the action of machinery and equipment operated by compressed air.

Today Ross Air Control Valves are helping to speed up production of rifles, machine guns, anti-aircraft guns, bombs, cartridges, shells, tanks, trucks, tires, aircraft, and in controlling various devices on board fighting ships and airplane carriers.

**ROSS**  
Air Control  
VALVES

THE  
BRIDLE  
FOR  
AIR HORSEPOWER

Regardless of your location, there is a Ross representative close by who is eager to help you keep your air actuated equipment operating at top efficiency . . . with one purpose uppermost in mind . . . shortening as much as possible this war and the road to VICTORY!

★ A SIZE AND TYPE FOR EVERY OPERATION ★



**ROSS Operating VALVE CO.**  
6492 EPWORTH BLVD · DETROIT, MICH.



**SECOMET** Resinoid Bonded Diamond Wheels can do your work more accurately, faster and without appreciable wear. They are most economical for sharpening cemented carbide and multi-bladed tools, such as milling cutters, broaches, etc. Moreover, their sharp, free-cutting action eliminates lapping and the usual semi-finish grinding operation. Catalog on request.

Prompt deliveries

**J. K. SMIT & SONS, INC.**  
157 Chambers Street, New York



## RUTHMAN GUSHER COOLANT PUMPS

### UP PRODUCTION

Gusher Pumps save time. No priming. They have split-second control. Provide a copious, steady, dependable flow of coolant. Full ball-bearing design. Other exclusive features to help you "up" production.



Model 2-P3

Write for  
Data and  
Specifications

#### Baby Gusher

P3 Baby Gushers are available in external right or left discharge types, flange-mounted and immersed models.

Pat. and Pats. Pending.

**THE RUTHMAN MACHINERY CO.**  
1815 READING ROAD, CINCINNATI, OHIO  
LARGEST EXCLUSIVE BUILDERS OF COOLANT PUMPS

## PASSING PARADE

tional Automatic Tool Company, Richmond, Indiana, as sales engineer in their Detroit office.

**GEORGE D. LAUGHTER**, for the past ten years associated with the Sheffield Corporation of Dayton as tool and die engineer, has joined the personnel of the Production Products Company, Dayton, Ohio, as assistant general manager.



**GEORGE D. LAUGHTER**  
Now with Production Products.

**SYNCO DEVICES, INC.**, 3265 Bermuda Avenue, Ferndale, Michigan, has absorbed Walco Precision Products, Incorporated, of Ferndale, Michigan. These two constituent companies were controlled and operated by the present owners and directors of Synco Devices, Inc. The new officers and positions are as follows: Hobart D. Andreae, president; Maynard D. Andreae, vice-president; George E. Lewis, vice-president; Wayne A. Andreae, treasurer; and Fred Dye, secretary.

**SUPREX GAGE COMPANY** announces the occupancy of their new plant and offices at 1300 East Nine-Mile Road, Ferndale, Michigan.

### Died

**HOWARD D. COLMAN**, founder and president of Barber-Colman Company, Rockford, Illinois, died on June 25. Mr. Colman, who was 69 years old, was engaged in experimental work in connection with National Defense at the time of his death.

The partnership of Barber & Colman was formed when, as a boy of seventeen, he attracted the attention of Mr. W. A. Barber with a wooden model of a machine for "drawing in" warps in cotton weaving mills. The partners first commercial venture was the manufacture and sale of a pump invented by Mr. Colman.

Experimental and development work in textile machinery again drew his attention and he invented several machines. Mr. Colman later became interested in various electrical devices and developed an electrical apparatus division for his company.

PRODUCTION STEP UP

## WITH GROB

### DIE MAKING MACHINES

"THE TOOLMAKER'S BEST FRIEND"

Unmatchable Performance for most difficult sawing and filing of tools and dies.

Compact, powerfully built, for rigorous shop service. Faster, more economical in operation.

Write or wire for details and prices

**GROB BROTHERS**  
DRAFTON WISCONSIN

REGRIND TO LOWER COSTS
REGRIND TO SAVE TIME

### ROTARY POWER CUTTERS

"Ground from the Solid after Hardening"

DESIGNED AND SERVICED BY

### SEVERANCE TOOL COMPANY

SAGINAW, MICHIGAN

1522 East Genesee Avenue

**TO HELP YOU  
TEACH THE NEW  
GRINDER HAND**

how to get maximum service from your Diamond Tools—we have some effective training material. Send for it. No obligation.

**KOEBEL DIAMOND TOOL CO.**  
9348 Grinnell Ave., Detroit

## KOEELITE DIAMOND TOOLS

Multi-Point, Multi-Set, Multi-Edge, and Single Set. Diamonds for All Industrial Purposes.

THE TOOL ENGINEER

*Cut  
Production  
Time*



## INSTALL A WELLS METAL CUTTING BAND SAW

Today's all-out war program, calls for close efficiency in cost and consumed time in production. A WELLS METAL CUTTING BAND SAW has solved the problem in thousands of plants. A rugged, accurate Wells saw, with its many features and flexibility, is a real asset to your plant.



Write today for Specifications of Wells Metal Cutting Band Saws Nos. 5 and 8

A large stock of blades is available at all times

WELLS MANUFACTURING CORPORATION  
THREE RIVERS, MICHIGAN

**WELLS METAL CUTTING  
BAND SAWS**

## Full Hardened — then Drilled at Assembly



4 Countersunk 1/2" Holes in  
12 Minutes in Hardened Work  
Spindle for Threadmill.

● Any drill press operator can drill, countersink and counterbore hardened steels with "HARDSTEEL" drills and produce accurate, smooth holes quickly and with an ease that will amaze you.

No annealing—no grinding—no rehardening—no distortion. A boon to die makers—a production tool that is changing shop practice in hundreds of plants.

Used with standard drill presses and jigs. Easy to regrind. Sizes 1/8" to 1" from stock. Special sizes to order.

You harden it—we'll drill it—  
with "HARDSTEEL"

The "HARDSTEEL" Instruction Handbook tells how. Write for a copy—  
BLACK DRILL CO., 5005 EUCLID AVE., CLEVELAND, OHIO



**REAMERS • TOOL BITS**

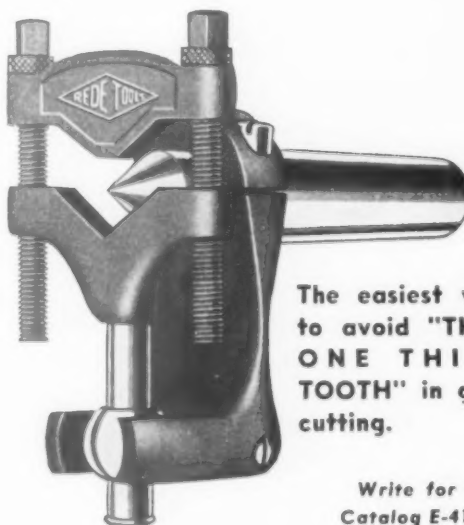
AUGUST, 1942

## UNIVERSAL BUSHINGS WORK FOR UNCLE SAM

Drill Bushings are a small but important cog in the precision manufacture of war equipment being built today for Uncle Sam. Because of their straight and round super-finished bores Universal Bushings assure accuracy and unexcelled wearing qualities. Write for facts.

**UNIVERSAL ENGINEERING CO.**  
FRANKENMUTH • MICHIGAN

## ACCURATE SPACING ASSURED with the RED-E MILLING MACHINE DOG



The easiest way  
to avoid "THAT  
ONE THICK  
TOOTH" in gear  
cutting.

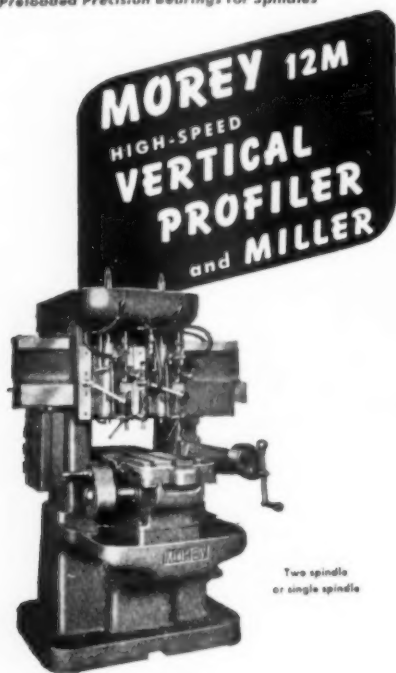
Write for  
Catalog E-41

**THE READY TOOL COMPANY**

585 IRANISTAN AVE.

BRIDGEPORT

CONN.



Two spindle or single spindle

Speed and more speed in the production of interchangeable parts requiring milling of any contour or outline is yours in the MOREY 12M. Provision for increased clearance between spindles and table.

Ask for Bulletin 680-A

**MOREY MACHINERY CO., INC.**  
410 Broome Street New York, N. Y.

## WANTED SCREW MACHINES

*Any Make or Model  
In Any Condition*

**MODERN COLLET  
and MACHINE CO.**

407 Salliotte St. - Ecorse, Mich.

## PASSING PARADE

**S. HOUGHTON COX**, vice-president and director of The Cleveland Twist Drill Company, died in Pasadena, California, on July 12, 1942. Up to the time of his death, Mr. Cox served actively as a director, although he was not actively engaged in the conduct of the business, which was founded by his father, the late **JACOB D. COX II**, in 1876. His younger brother **JACOB D. COX III**, is president and general manager of the company.

**PERRIN G. MARCH**, president of the Cincinnati Shaper Company, died suddenly of a heart attack at his home in Fernbank. Born in Fernbank 55 years ago, Mr. March was a son of the founder of the company.

Mr. March held memberships in the National Association of Machine Tool Builders, Board of Directors of Ohio Mechanics Institute, and the Cincinnati branch of the National Metal Trades Association.

**ROBERT F. RUNGE**, vice-president of S K F Industries, Inc., Philadelphia manufacturers of ball and roller bearings, died July 6th in Germantown Hospital after a prolonged illness. **MR. RUNGE**, who was 56 years old, spent his entire business career with S K F and its predecessor, the Hess-Bright firm. He became vice-president of the company in 1920.

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2842 W. Grand Blvd. Detroit, Mich.

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**PRACTICAL TOOL ROOM FOREMAN** for long established Newark Area concern, now engaged in defense work; permanent connection is offered to qualified man, must be fully conversant with operation of Modern Tool Room, capable to lay out and supervise work; write full particulars first letter, including past connections and salaries. Box 741, The TOOL ENGINEER.

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#### WANTED

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MACHINERY  
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An outstanding opportunity for experienced Methods Engineers, Tool Engineers, and Tool Designers having practical experience and ability in machine tools, jigs, fixtures, etc., electric wiring and light assemblies.

These are permanent positions with liberal salaries in an organization with large war orders as well as post war plans. Write giving full personal history, experience and present salary; personal interview will be arranged later. We do not desire applications from men in key defense positions.

**BOX 740, THE TOOL ENGINEER**

THE TOOL ENGINEER





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BONDS  
TO  
BUY  
BOMBS**

**MULTIPLE INSTALLATIONS  
USING THE  
GOVRO NELSON  
SELF CONTAINED UNITS WILL  
INCREASE PRODUCTION  
IMPROVE QUALITY  
LOWER COSTS**

SEND DRAWING FOR RECOMMENDATION

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Closer tolerance  
Micrometer Accuracy  
Because: Wing key  
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and absolute dia-  
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STEEL  
REAMERS**

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- Will not chatter.
- Chrome-like finish.
- Perfect alignment.
- Full bearing surface.
- Left and right spirals.
- 50 to 80 thousandths expansion.
- Cannot fall in slots or oil grooves.
- Extension pilots for line-up work.

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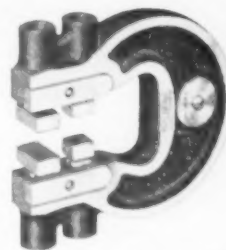
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30 DAYS' TRIAL**

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LIMIT PLUG THREAD GAGES

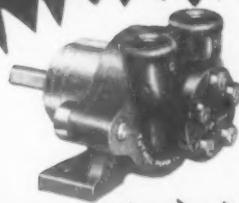
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YEARS AGO, the first educational shell orders called up for service the Taft-Peirce line of Thread Gages. Since then, the Taft-Peirce Thread Gage Department has doubled, redoubled—now reaches a size where it has had to be moved into a six-story plant of its own, adjacent to the main plant.

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for every gaging need



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YOU CAN DEPEND ON  
FOR BIG JOBS

Typical of Tuthill's complete line of dependable small pumps is the Model L series. Hundreds of thousands of these positive displacement internal-gear rotary pumps prove their superiority in action. Ideal for coolant, lubrication, fuel oil transfer, hydraulic mechanisms and oil burners.



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SERVING ARMY • NAVY • AIR FORCE • MERCHANT MARINE AND INDUSTRY

# ADVERTISERS APPEARING IN THIS ISSUE

## The Tool Engineer

Advertising Offices: New York, Chicago, Providence, Detroit, San Francisco, Los Angeles  
(see page 3 for addresses)

Abrasive Dressing Tool Co.	4	Fitchburg Grinding Machine Corp., The	59	Muehlhausen Spring Corp.	128
Acme Industrial Co.	177	Galland-Henning Mfg. Co., The	118	Mustwin	174
Ajax Steel & Forge Co.	177	Gallmeyer & Livingston Co.	170	National Tool Salvage Co.	172
Allegheny Ludlum Steel Corp.	21	Gammmons-Hoaglund Co., The	175	Nielsen, Incorporated	167
Amco Gage Co.	166	Garrison Machine Works, Inc.	172	Norton Company	37
American Broach & Machine Co.	46	Giern & Anholtt Tool Co.	143	OK Tool Co., The	147
American Chain & Cable Co., Inc.	143	Gisholt Machine Co.	33, 57	O'Neil-Irwin Mfg. Co.	172
American Designing & Engineering Co.	108	Glenzer Co., The J. C.	149	Oster Mfg. Company, The	53
Ames Co., B. C.	35	Gorton Machine Co., Geo.	38	Ott Machinery Sales, Inc.	186
Ampco Metal, Inc.	104	Greenfield Tap & Die Corp.	64	Pioneer Engineering & Mfg. Co.	100
Apex Machine & Tool Co., The	54	Grab Brothers	184	Plan-O-Mill Corp.	48
Armstrong-Blum Mfg. Co.	106	Hanna Engineering Works	50	Porter Cable Machine Co.	141
Armstrong Bros. Tool Co.	167	Hannifin Mfg. Co.	62	Potter & Johnston Machine Co.	29
Avey Drilling Machine Co. The	148	Hardinge Brothers, Inc.	Front Cover	Pratt & Whitney Div.	2nd Cover
Baker Brothers, Inc.	43	Hartford Special Machinery Co., The	165	Proconer Safety Chuck Co.	169
Barber-Colman Co.	34	Haskins Co., R. G.	181	Production Products Co.	179
Barnes Co., W. F. & John	40	Haynes-Stellite Co.	8	Producto Machine Company, The	173
Barnes Corp., John S.	141	Heald Machine Co., The	26	Putnam Tool Co.	181
Besly & Company, Charles H.	52	Hersam, Conrad O.	159	Pyott Foundry & Machine Co.	163
Black Drill Co.	185	Hobart Brothers	174	Racine Tool & Machine Co.	167
Blake Company, Edward	153	Hole Engineering Service	187	Ransome Concrete Machinery Co.	158
Blanchard Machine Co., The	126	Holo-Krome Screw Corp., The	2	Ready Tool Company, The	185
Boice-Crane Co.	130	Ideal Commutator Dresser Company	183	Rivett Lathe & Grinder, Inc.	3rd Cover
Boyar-Schultz Corp.	179	Industrial Engineering Co., Inc.	165	Ross Operating Valve Co.	183
Bradford Machine Tool Co., The	120	International Nickel Co., Inc., The	41	Ruthman Machinery Co., The	184
Braeburn Alloy Steel Corp.	153	Jarvis Co., The Chas. L.	45	Safety Grinding Wheel & Machine Co.	129
Brouer Electric Mfg. Co.	168	Jefferson Machine Tool Co.	167	Savage Tool Co.	150
Brewster-Squires Co.	175	Jones & Lamson Machine Co.	6, 7	Scher Engineering Co., George	155
Brown & Sharpe Mfg. Co.	173	Kearney & Trecker Corp.	5	Scherr Company, Inc., George	145
Buhr Machine Tool Co.	161	Kent-Owens Machine Co.	42	Scully-Jones & Co.	127
Campbell Division, Andrew C., American Chain & Cable Co., Inc.	143	Knight Machinery Co., W. B.	92	Sellers & Co., Inc., Wm.	163
Carbide Fabricators Div.	139	Koebel Diamond Tool Co.	184	Seneca Falls Machine Co.	58
Carboloy Co., Inc.	103	Landis Tool Co.	55	Severance Tool Co.	184
Carpenter Steel Co., The	137	LaSalle Designing Co.	146	Sheffield Corp., The	109
Cerro de Pasco Copper Corp.	169	Latrobe Electric Steel Co.	51	Sheldon Machine Co., Inc.	165
Chicago Manufacturing & Distributing Co.	162	Leach Machinery Co., H.	177	Sidney Machine Tool Co., The	39
Chicago Rawhide & Mfg. Co.	171	LeBlond Machine Tool Co., The R. K.	4th Cover	Siewek Tool Co.	151
Chicago Wheel & Mfg. Co.	180	Lewthwaite Machine Co., T. H.	182	Smit & Sons, Inc., J. K.	183
Cincinnati Milling Machines & Cincinnati Grinders, Inc.	122	Liberty Tool & Gage Works	154	Snyder Tool & Engineering Co.	44
Circle Tip Tool Co.	155	Lima Electric Motor Co., The	142	South Bend Lathe Works	12
Cleveland Automatic Machine Co., The	101	Link Engineering Company	163	Standard Gage Co., Inc.	1
Cleveland Twist Drill Co., The	28	Lipe-Rollway Corp.	16	Starrett Co., The L. S.	86
Columbia Tool Steel Co.	179	Lodge & Shipley Machine Tool Co.	107	Strippit Corporation, The	164
Continental Machines, Inc.	27	Logansport Machine, Inc.	17	Stuart Oil Co., Ltd., D. A.	90
Cooley Electric Mfg. Corp.	138	Lombard Governor Corp.	151	Sturdimatic Tool Co.	165
Copperweld Steel Co.	47	Lovejoy Tool Co.	61	Sturtevant Co., P. A.	169
Cullen-Friestedt Co.	164	Lyon Metal Products Co., The	179	Sundstrand Machine Tool Co.	20
Cunningham Co., M. E.	174	Machine Products Corp.	149	Sunnens Products Co.	24
Cushman Chuck Co., The	178	Macklin Co.	190	Swartz Tool Products Co., Inc.	161
Dalzen Tool & Mfg. Co.	119	Madison-Kipp Corp.	60	Synco Devices, Inc.	145
Danly Machine Specialties, Inc.	168	Majestic Tool & Mfg. Co.	175	Taft-Peirce Mfg. Co., The	187
Davis Boring Tool Division	25	Master Chrome Service, Inc.	117	Tannewitz Works, The	152
Dearborn Gage Co.	110	Master Tool Co., Inc.	117	Toril Mfg. Co.	168
Delta Mfg. Co., The	49	Matthews & Co., Jas. H.	181	Tungsten Electric Corp.	176
Detroit Broach Co.	10, 11	M-B Products	182	Tuthill Pump Co.	187
Detroit Stamping Co.	177	McCrosky Tool Corp.	140	Union Carbide & Carbon Corp.	8
Diamond Tool Co.	187	McGowan Engineering Service	182	United Precision Products Co.	158
DoAll Company, The	170	McKenna Metals Co.	94	United States Drill Head Co.	170
Dodge Chicago Plant, Division of Chrysler Corporation	13	Mead Specialties Co.	172	Universal Engineering Co.	181, 185
Douglas Machinery Co., Inc.	169, 175	Michigan Tool Co.	125	U. S. Machine Tool Mfg. Corp.	173
Dumore Company, The	160	Micromatic Hone Corp.	22, 23	Van Norman Machine Tool Co.	14, 15
Eastern Cutter Salvage Corp.	117	Mid-West Tool & Mfg. Co.	30	Vascoloy-Ramet Corp.	32
Eclipse Counterbore Co.	56	Modern Collet & Machine Co.	186	Vinco Corp.	171
Electro-Matic Products Co.	163	Mohr Lino-Saw Company	166	Warner & Swasey Co.	85
Ettco Tool Co.	173	Moline Tool Co.	102	Welding Equipment & Supply Co.	124
Evans Flexible Reamer Corp.	187	Monarch Machine Tool Co., The	36	Weldon Roberts Rubber Co.	147
Everede Tool Co.	174	Monarch Tool Company	144	Wells Mfg. Co.	185
Ex-Cell-O Corp.	9	Moore Mfg. Co., William	182	Westinghouse Electric & Mfg. Co.	31
Firth-Sterling Steel Co.	18, 19	Morey Machinery Co., Inc.	166, 171, 186	Wheel Trueing Tool Co.	115, 116
		Morse Tool Co.	139	Whistler & Sons, Inc., S. B.	171
		Motor Tool Co.	189	Zeh & Hahnemann Co.	183
				Ziegler Tool Co., W. M.	159



# MOTOR TOOL

Ball and Roller Bearing

# LIVE CENTERS

Take the Brake  
off Production—  
HERE!

Dead centers put a needless brake on your machines—and your production—because of FRICTION.

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OF  
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## FEATURES

Simple Design . . . Heavy Duty . . .  
Greater Radial and Thrust Load Carry-  
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Locking Feature for Redressing Point  
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for Expansion of Metal.

**MOTOR TOOL MANUFACTURING CO.**  
**METAL CUTTING TOOLS**  
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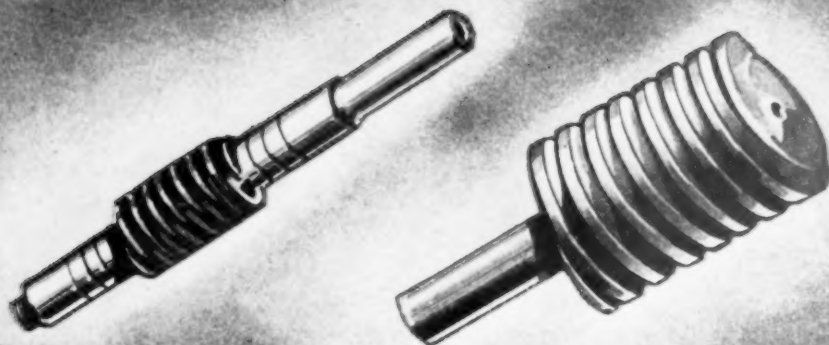
Make it a Rule  
to Call Motor Tool



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***TOPS** for thread grinding*



In hundreds of production plants **MACKLIN THREAD GRINDING WHEELS** have been found to be most efficient. On practically every job a **MACKLIN** resinoid thread grinding wheel has solved the problem. Grain size depends on type of thread and finish required. Proper wheel and work speeds are very important. A **MACKLIN FIELD ENGINEER** will be glad to assist you upon your request.

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THE RIVETT HAND SCREW MACHINE reflects these objectives in production by its economy, operating convenience and precision. The value of this machine should be considered and recognized for initial and second operations on small precision work. Many jobs now produced on heavy, costlier units are more quickly set up and finished to closer limits on Rivett hand screw machines. The "critical," larger machines are thus released for more suitable work.

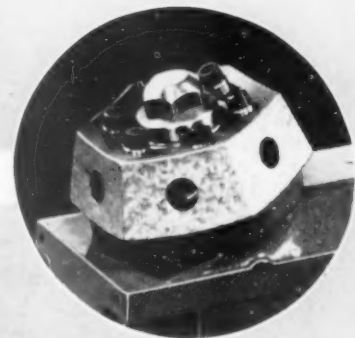
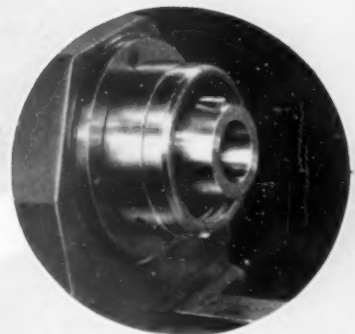
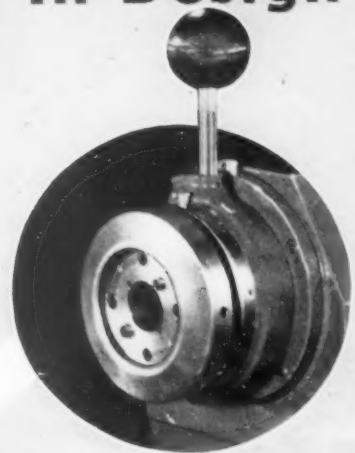


Send for  
Bulletin 918A

Positive Lever Chucking  
Ball Bearing Spindle  
Self-Locking Turret



## In Design



### RIVETT 918 HAND SCREW MACHINE

9" Swing over Bed  
6" Capacity with Jaw Chucks  
6" Capacity with Step Chucks  
1" Capacity with Draw-in Collets  
or  
1" Capacity with Push-out Collets  
8 Spindle speeds 150-2500 r.p.m.  
or  
8 Spindle speeds 225-3750 r.p.m.

# RIVETT

PIONEERS IN BENCH

## LATHE & GRINDER INC.

BRIGHTON, BOSTON, MASS.

LATHE DEVELOPMENT



# I'm Tellin' You..

(No. 1 in a series of tips on "Keeping 'em Turning")

I've been building LeBlond Lathes for about 36 years now. I know that they're rugged and will put up with a certain amount of abuse. But this is no time for an operator to see how careless he can be. You young fellows who are maybe new at running a lathe—and you old hands who sometimes forget, have a listen to a guy who should know some of the tricks to "keep 'em turning."

First off, in setting up a new lathe *read your instruction book*. We put an awful lot of care into a LeBlond to get the accuracy shown on the inspection test card. But we might just as well spend our time fishing if you miss on getting it set up level. An ordinary carpenter's level won't do — it's not nearly sensitive enough. It takes a precision ground bulb level. You also want to use this instrument to check the alignment of the older machines from time to time.

After you are set up according to the book, study the lubrication chart. This is important. Look at the pictures below. These are the spots that need oiling every day.

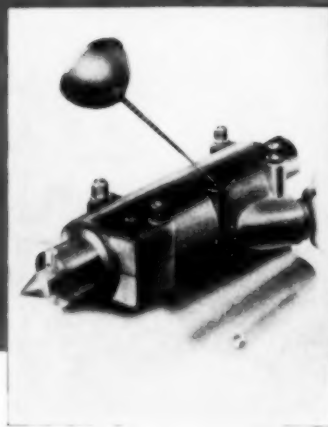
*Chester G. Palston*



NOT THIS WAY



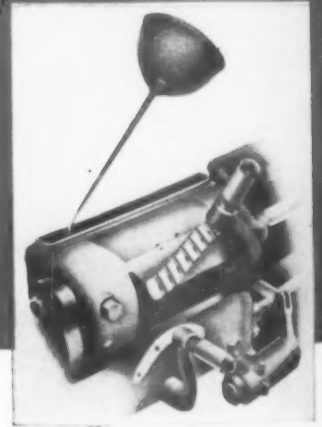
**Head Stock** — Don't let oil level get below one inch from top of intake. Use a good grade of machine oil SAE 30.



**Tailstock** — This top unscrews. Keep the felt filtering pad saturated by daily oilings from a can.



**Apron** — Keep SAE 30 oil at a level where it can be seen at intake. Work plunger in and out slowly 3 or 4 times daily.



**Feed Box** — Keep the felt filtering pad in the trough saturated by daily oilings from a can.

**THE R. K. LEBLOND MACHINE TOOL CO.**  
Cincinnati, Ohio

*Largest Manufacturer of a Complete Line of Lathe*



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